Issue #297

OUR 25th ANNIVERSARY YEAR!

June 1985
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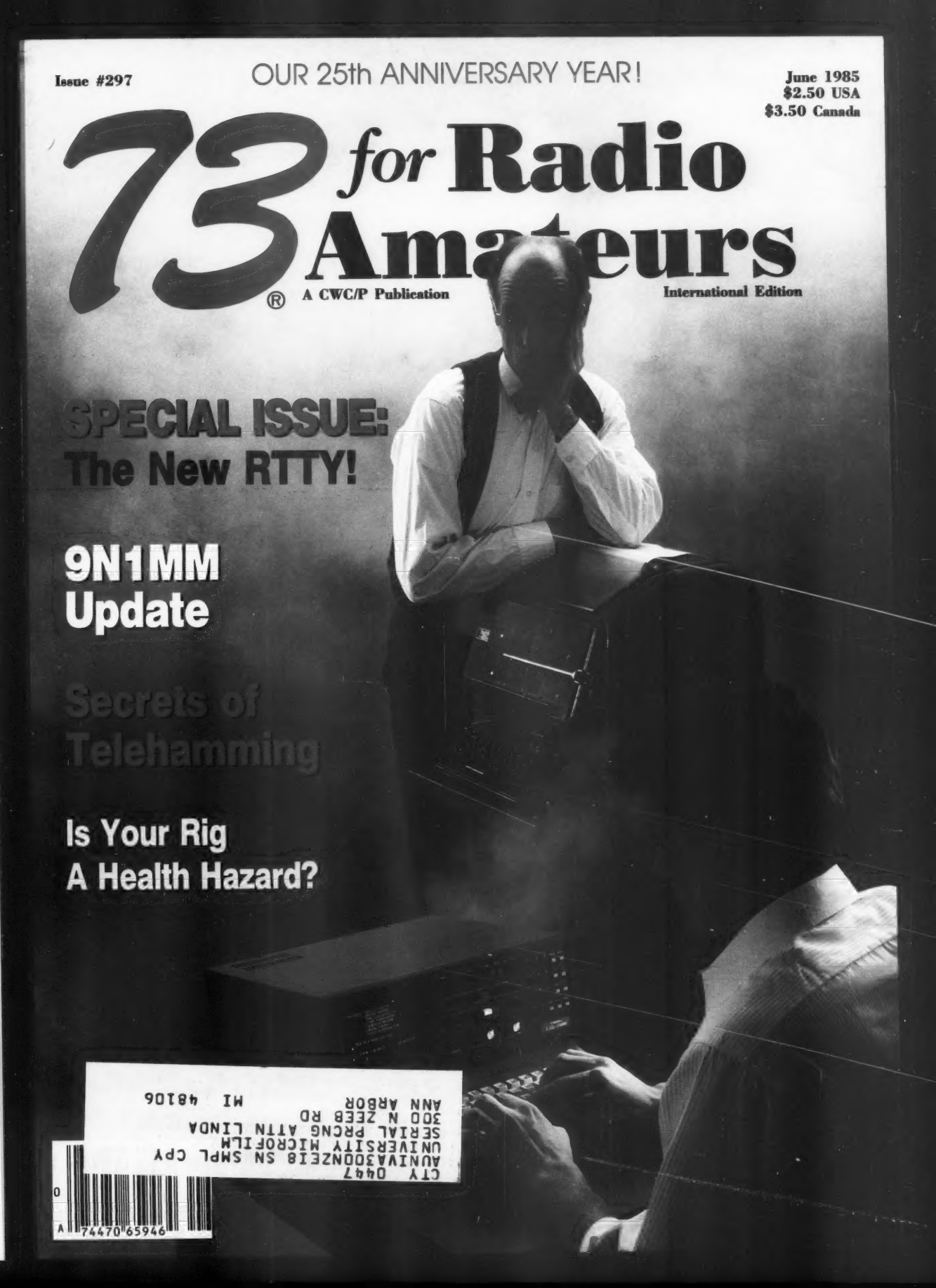
A CWC/P Publication

International Edition



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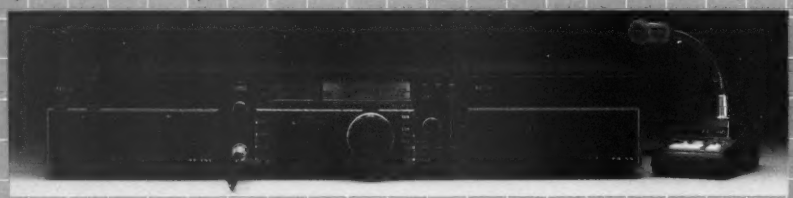

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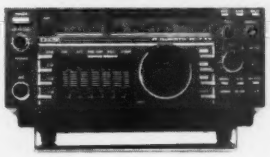

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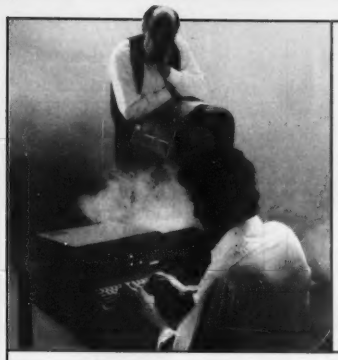

73 for Radio Amateurs®

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WHAT?

News from the Publisher

What you'll notice right away is that we no longer have a "Never Say Die" column. Wayne is not dead or dying. He simply resigned his writing responsibilities. This is not a case of "so-and-so resigned" meaning "so-and-so was 'asked' to resign." No way. I got a note from Wayne dated 4/5/85. In part, it said, "My loss of interest in *73* is no secret...list me as founder and let's end the charade that I'm the editor." Saturday morning, April 13, I went up from where I live to where Wayne does (.8 miles). "Is there anything you'd like me to pass along to our readers about you quitting writing—anything at all?" No. "Nothing, you're sure?" Nothing. And then he started talking with an old friend about amateur radio and *73* and how he had been the first person on the air from our shack on Ham-Day, March 24th. He was. Is it say never write or Never Say Die? Time will tell. Wayne is not connected with *73* in any official way—nor has he been for some time—but his page is always here if he wants it.

Three Notes:

1) A reader from Erie, Pennsylvania, wrote: "...this is a first for me. But I nearly didn't write because of your seventh point concerning mail (April "What?"; mail up 14%). I hope this does make it..." It did. They all do. Let's go for 20%.

2) A potential advertiser from a different time zone recently called me at home (which is perfectly OK). I was running late and about 24 minutes away from playing in a basketball playoff game. The phone rang. I picked it up. He said, "Hi, Jack..." I cut him off: "Hi, (Blank), I can't talk right now, I'm on my way out the door." When we next talked, (Blank) seemed a little bit subdued. "What's the problem?" I asked. "Well," he said, "you said you were out the door. Who can I deal with now?" We got the nuances of doors straightened out.

3) A call came in from a nice lady who needed "one of those ham radios." Could we help her? "If you don't mind me asking, why do you need one of these ham radios?" Well, it turned out that she wanted to get a rig for her OM for his birthday. He had been out of amateur radio for some time, but now he wanted to get back in. She had had to wait until he went out of town on business in order to make sure he was totally surprised. We put her in touch with a dealer in her area and wished her the best of luck. "Now," I said, "I suppose you're going to tell me that his birthday is tomorrow." "Yes, yes, and thank you so very, very much for your help!" "Well, that's what we're here for." I felt a little bit stupid saying that, but in retrospect I'm not sorry I did. Helping people out IS what we're here for.

Jack Burnett

MPA

73 for Radio Amateurs is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes 57 computer publications in more than 20 major countries. Nine million people read one or more of the group's publications each month. Members of the group include: Argentina's *Computerworld/Argentina;* Asia's *The Asian Computerworld;* Australia's *Computerworld Australia, Australian PC World, Macworld* and *Directories;* Brazil's *DataNews* and *MicroMundo;* China's *China Computerworld;* Denmark's *Computerworld/Danmark, PC World* and *RUN* (Commodore); Finland's *Mikro;* France's *Le Monde Informatique, Golden* (Apple), *OPC* (IBM) and *Distributique;* Germany's *Computerwoche, Microcomputerwelt, PC Welt, SoftwareMarkt, CW Edition/Seminar, Computer Business, RUN* and *Apple's;* Italy's *Computerworld Italia* and *PC Magazine;* Japan's *Computerworld Japan;* Mexico's *Computerworld/Mexico* and *CompuMundo;* The Netherland's *Computerworld Benelux* and *PC World Benelux;* Norway's *Computerworld Norge, PC World* and *RUN* (Commodore); Saudi Arabia's *Saudi Computerworld;* Spain's *Computerworld Espana, Microsistemas/PC World, Commodore World;* Sweden's *ComputerSweden, Mikrodatorn* and *Svenska PC;* the UK's *Computer Management, Computer News, PC Business World* and *Computer Business Europe;* Venezuela's *Computerworld Venezuela;* the US's *Computerworld, Hot CoCo, inCider, Infoworld, MacWorld, Micro Marketworld, PC World, RUN, 73, 80 Micro, Focus Publications* and *On Communications.*

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  TH-31AT/A: 220.000-224.995 MHz in 5 kHz steps.
  TH-41AT/A: 440.000-449.995 MHz in 5 kHz steps.

- **Repeater offset switch.**
  TH-21AT/A: ±600 kHz, simplex.
  TH-31AT/A: −1.6 MHz, reverse, simplex.
  TH-41AT/A: ±5 MHz, simplex.
- **Standard accessories:** Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.
- **Quick change, locking battery case.** The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.** The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

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- **Easy-to-operate, functional design.** Three digit thumbwheel frequency selection and handy top-mounted controls increase operating ease.

Optional accessories:

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- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8** soft case for TH-21A/31A/41A
- **SC-8T** soft case for TH-21AT/31AT/41AT
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **Service manual**

More information on the TH-series HTs is available from authorized Kenwood dealers.

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TR-7950/7930

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- **Large, easy-to-read backlighted LCD readout.** Indicates receive/transmit frequency, frequency offset, sub-tone selection, memory status. An LED readout indicates S & RF units, REVERSE, CENTER TUNING, PRIORITY, and ON AIR.
- **Programmable scanning, with center-stop tuning.** Microprocessor technology allows you to scan the entire 2 meter band, or just a small portion of it. Scanning stops on the center frequency during band scan—**a Kenwood exclusive!**
- **21 Multi-function memory channels.** The TR-7950/7930 "remembers" frequency offset, and optional subtone channels. Memories 1-15 are for simplex and "normal" repeater operation. Memory pairs 16/17 and 18/19 are for "odd-ball" splits. Memories "A" and "B" store upper and lower band scan limits. The radio "beeps" when memory channel 1 is selected.
- **Extended frequency coverage.** Covers 142.000-148.995 MHz in 5-kHz steps. Repeater offsets are automatically selected in accordance with the ARRL 2 meter band plan. The front panel "OS" key may be used to allow manual changes in offset.
- **Multi-function keyboard.** The 16-key DTMF pad can also be used for direct frequency entry, subtone selection, memory address and scan programming. The keyboard is illuminated for night time use.

TR-7950 optional accessories:

- TU-79 three frequency tone unit
- PS-430 power supply
- KPS-12 fixed-station power supply for the TR-7950
- KPS-7A fixed-station power supply for the TR-7930
- SP-40 mobile speaker
- SP-50 mobile speaker
- MC-55 mobile microphone
- MC-46 16-key autopatch UP/DOWN microphone
- SWT-1 2 m, 100 W antenna tuner
- SW-100A/B power meters
- PG-3A noise filter

Model TR-7950 (45 watts) shown. TR-7930 is identical, but with 25 watts output.

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

Specifications and prices are subject to change without notice or obligation.

More TR-7950/7930 information is available from authorized Kenwood dealers.

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QRX. . .

EDITED BY PERRY DONHAM KW1O

Bash QRT

DICK BASH KL7IHP has closed the doors on his amateur-radio publishing business. Dick is probably one of the best-known figures in ham radio, and opinions of him are rather sharply divided between the "love him" and "hate him" camps. Before the VEC program came to fruition, it was common to hear comments like, "He really Bashed that test!" around the FCC examination room. Dick's *The Final Exam* study books included a verbatim listing of the questions and answers found on the FCC exams. Many hams felt that the books encouraged memorization rather than understanding of the theory and regulations, and they blamed Bash for everything from CB radio to the declining sunspot cycle. Others pointed out that the study guides were strikingly similar to those published for would-be pilots, engineers, and steam fitters and bore a strong resemblance to guides published for many years by the ARRL. Now that the VEC program is under full steam and the entire pool of questions is in the public domain, Dick says he has "nothing to sell." Like him or not, Dick Bash has left a permanent mark on amateur radio.

VEC Three

A THIRD NATIONAL VEC has been appointed by the FCC. **The DeVry Amateur Radio Society,** since the beginning a VEC in the 9th call area, has expanded its operation to encompass all United States call areas. DeVry professor **Jim Georgias W9JUG** says that their program offers "an alternative based on experience in electronics education and a long dedication to amateur radio." You can contact Jim at (312)-929-8500 for complete details.

Creme de la Ham

1985'S HAM OF THE YEAR was honored recently at the Dayton Hamvention. **John Willig W8ACE/4** received his award at the annual Saturday-night banquet, with over 800 fellow amateurs looking on. Known as "Mr. Hamvention," it was John who, in 1951, came up with the idea of putting on a little hamfest in Dayton, Ohio. This year's Special Achievement Award went to **Judy Frye KG8P** for her efforts in establishing the all-volunteer amateur examination program. Judy is responsible for many of the methods and procedures used and was cited by Senator Barry Goldwater as one of the key individuals responsible for the initial success of the program. **Rich Whiting W0TN** was the recipient of the Technical Excellence Award for his work in developing the Teleconference Radio Network (TRN). TRN is an on-the-air forum using teleconferencing technology that allows thousands of amateurs to participate in discussions with notable figures and experts in the field of ham radio. *73* congratulates John, Judy, and Rich for their tireless efforts to better our hobby.

China Chat

SIGNALS FROM CHINA will be heard on June 15th as a group of hams on tour pay a visit to BY1PK. Plans call for operation from 8:30 am to 11:30 am Beijing time. Activity in China is really picking up, with new stations popping up almost weekly now. The operators are learning to work the pileups, though most BY hams prefer to have a casual rag-chew. Don't be surprised if someone in Beijing answers your next CQ!

Space Balk

NASA HAS DISALLOWED any modification to the Space Shuttle's cargo bay to accommodate a ten-meter antenna, severely limiting the planned ham-in-space flight of **Dr. Tony England W0ORE** and **John-David Bartoe W4NTZ.** The ten-meter SSTV experiment has been scrapped, but some two-meter slow-scan will be attempted using the window antenna and Motorola HT that Owen Garriott W5LFL carried on his historic flight. Tony has decided to emphasize the educational aspects of ham radio and will spend most of his limited operating time contacting radio clubs and schools. The ARRL is acting as a clearinghouse for organizations wishing to participate. Several delays have set the orbiter's scheduled launch back to mid-July; next month's column will contain the latest flight plan, or you can access the *73* RBBS at (603)-924-9809 for up-to-the-minute information.

Hamtastic!

HAM DAY '85 filled a few pages in the log here at W2NSD/1. The crew at *73* was on the air nearly all day, manned by **Perry Donham KW1O, Chris Schmidt KA1MPL,** and, of course, **Wayne Green W2NSD** himself. Visitors to the shack included **Nancy Cook,** her daughter **Rachel,** and **Hope Currier.** From the letters we've received, Ham Day introduced thousands of people to the magic of amateur radio through individual demonstrations. We'll soon be hearing a flood of new calls on the bands!

Rules Revised

FIELD DAY RULES have been modified to allow additional bonus points for packet-radio contacts. The ARRL Contest Advisory Committee, acting on a request by **Thomas Clements III W1ICH,** quickly approved a 100-point reward for completing at least one packet QSO. You may add the following to your Field Day rules: "An additional 100 points can be earned by completing at least one QSO on packet radio during the Field Day period. The repeater provision is waived for packet-radio QSOs. A packet station does not count as an additional transmitter. On the summary sheet, show packet radio as a separate band." Field Day will be held the 22nd and 23rd of June—look for the *73* gang on the air as W1XU!

Leaky Lines

THE ARRL has strongly opposed FCC Mass Media Docket 85-38, which seeks to relax quality standards for cable-television systems, allowing larger signal leakage levels in the 54–216-MHz band. In its comments, the League stated, "It would appear that the proposed increase in maximum cable signal leakage levels is unnecessary to well-engineered, well-maintained systems...Only those systems which exhibit leakage levels in excess of presently permitted leakage maxima would be rewarded for their failure to adequately maintain their systems by legalization of existing rule violations." The ARRL pointed out that they receive between 4 and 10 communications weekly from amateurs requesting technical assistance with regard to cable-TV interference. During a hearing in which FCC Chairman Fowler went before the Senate Subcommittee on Communications, Senator Goldwater asked Chairman Fowler about the proposed legislation, and whether cable-television operators would still be responsible for eliminating interference, regardless of the level of leakage from the cable. Fowler's reply: "Absolutely!"

Code Convicts

NATIONAL VEC W5YI has been notified of what may be the first documented case of cheating on a volunteer-administered examination. Lakeville, Indiana, VE, **Larry Weaver KB9V,** reports that his VE team ob-

served two testees scribbling gibberish on their exam papers during the Morse-code portion of the session. Later, the pair turned in sheets with perfect scores—for the previous month's test! When approached, one of the applicants bolted for the door, Form 610 in hand. The other confessed that a third accomplice had secretly taped the earlier exam with a microcassette recorder. The FCC's Compliance Branch is looking into the matter.

Sat Session Set

AMATEUR SATELLITES will be the topic of the next North American Teleconference Radio Net (TRN), scheduled for June 14th. An overview of the OSCAR program will be presented, including information on how to get started in satellite communication, how amateur satellites are launched and built, and what kinds of plans are on the drawing board for future OSCARs. Featured speakers for this TRN include **John Browning W6SP, Rip Riportella WA2LQQ, Tom Clark W3IWI, John Champa K8OCL,** and **Bill Tynan W3XO.** This is a good opportunity to pick up the information you need to get started in this exciting phase of amateur radio. For information about TRN, contact Net Manager Timothy Lowenstein, c/o Midway Amateur Radio Club, PO Box 1231, Kearney NE 68847-1231.

QRM?

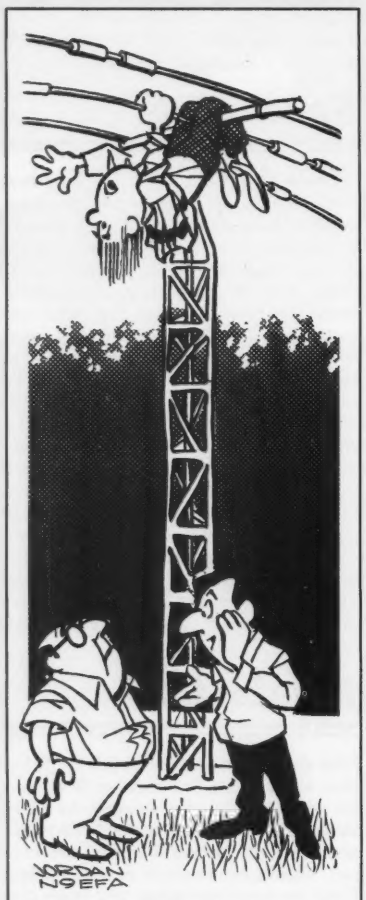
A REPORT AND ORDER issued by the FCC recently allows commercial broadcast stations licensed by the FCC and operating in the Pacific outside of ITU Region 2 (North America, South America, and Greenland) to transmit on frequencies between 7100 and 7300 kHz. The Order stipulates that none of the stations may operate at any time with their antennas aimed at Region 2. It also sets limits on the amount of radiated energy that is allowed to leak into Region 2 during the hours from 0800 to 1600 UTC: 12 dB below the major lobe for antennas with gains greater than 15 dB, and 6 dB below the major lobe for antennas of less than 15 dB gain. It's not clear yet just how much extra interference this will cause on the already congested 40-meter band.

Forty Phone

CARIBBEAN AMATEURS soon will be able to use phone in the 7075–7100-kHz band. Hams in Alaska and Hawaii already have this privilege. A petition filed last November by **David Novoa KP4AM** noted that the Caribbean is the only FCC jurisdiction outside of the continental US where amateurs may not operate in this segment. David said that interference from broadcast stations makes frequencies above 7100 kHz useless at night. He further reasoned that use of 7075–7100 kHz would promote international goodwill and would not interfere with CW operation stateside. The FCC proposes to amend Section 97.61, paragraph 1, limitation 1 to read, "The use of A3E and F3E in this band is limited to amateur radio stations transmitting from any location other than the forty-eight contiguous states." The Puerto Rico Amateur Radio Club suggests limiting the privileges to Advanced- and Extra-class licensees. Comments on the proposed rulemaking, Docket 85-104, are due by June 17, while reply comments should be in by July 17.

Packet Prize

A UNIQUE AWARD is being offered by the **Pacific Packet Radio Society (PPRS)** to encourage packet-radio enthusiasts to stretch the limits of digital communication. The "Golden Packet" will be presented to amateurs who complete the first terrestrial transcontinental packet network link and will consist of either a plaque or certificate suitably engraved for all of the participating stations. The system used for the transcontinental link must consist of fixed terrestrial digital store-and-forward radio links using VHF (greater than 144.1 MHz), UHF, or microwave frequencies. Use of HF, satellite, tropo, meteor scatter, or moonbounce is prohibited. For complete details, contact the Pacific Packet Radio Society, PO Box 51562, Palo Alto CA 94303.



I'd help Ralph get down but he's giving me a 1:1 swr!

Sudden Move

ALABAMA REPEATER OWNERS were surprised by a letter from Frequency Coordination Chairman **William Matthews WA4ZVJ** directing them to comply with a 20-kHz repeater spacing two-meter band plan by July 1, 1985, or lose their coordinated status. According to a story in the *W5YI Report*, Matthews wanted Alabama to switch to the new band plan first, setting an example for neighboring states Georgia, Tennessee, Mississippi, and Florida. An Alabama repeater owner claims that he "had heard nothing until a registered letter showed up saying that I had to move." There seems to be no room for discussion. As one owner said, "You can say anything you want, but if you are not on the new frequency by July 1st, you can forget your repeater."

Battle Zone

AMATEURS HAVE WON a major battle in North Carolina against a restrictive antenna ordinance that would have limited the installation of amateur UHF systems. The proposal, which had been approved by the Cumberland County Joint Planning Board, would have required a permit for the erection of a "satellite dish" of greater than 42 inches in diameter and would have banned dishes with a diameter greater than 12 feet. Speaking on behalf of the Cape Fear Amateur Radio Society, **Bert VanderClute N4ERM** pointed out that amateur-radio operators often use antennas similar in appearance to satellite-television dishes. He then cited the great contribution made by hams during times of crisis, such as the communications provided by amateurs after a tornado devastated the region last year. When the dust had settled and the matter was put to a vote, the hams won 4 to 1. Overwhelming support from the amateur community and a rational, well-presented argument were the key to this victory.

Help!

WE HAD HELP this month from the *W5YI Report, Gateway,* the *ARRL Letter,* and Contributing Editor Bill Pasternak WA6ITF. We'd love to hear from **you**—send your news items and photographs to *73* Magazine, 80 Pine Street, Peterborough NH 03458, Attn: "QRX."

THE STANDARD OF EXCELLENCE

The world of CW, RTTY, and new DUAL AMTOR is as close as your fingertips with the new brilliantly innovative state-of-the-art microcomputer controlled* EXL-5000E.

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Characters: Alphabet, Figures, Symbols, Special Characters, Kana.
Built-in Monitor: 5" high resolution, delayed persistence green monitor — provides sharp clear image with no jiggle or jitter even under fluorescent lighting. Also has a provision for composite video signal output.
Time Clock: Displays Month, Date, Hour and Minute on the screen.
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Selcal (Selective Calling) System: With this feature, the unit only receives messages following a preset code. Built-in Demodulator for High Performance: Newly designed high speed RTTY demodulator has receiving capability of as fast as 300 Baud. Three-step shifts select either 170Hz, 425Hz or 850Hz shift with manual fine tune control of space channel for odd shifts. HIGH (Mark Frequency 2125Hz)/LOW (Mark Frequency 1275Hz) tone pair select. Mark only or Space only copy capability for selective fading. ARQ/FEC features incorporated.
Crystal Controlled AFSK Modulator: A transceiver without FSK function can transmit in RTTY mode by utilizing the high stability crystal-controlled modulator controlled by the computer.
Photocoupler CW, FSK Keyer built-in: Very high voltage, high current photocoupler keyer is provided for CW, FSK keying.
Convenient ASCII Key Arrangement: The keyboard layout is ASCII arrangement with function keys. Automatic insertion of LTR/FIG code makes operation a breeze.
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Large Capacity Display Memory: Covers up to 1,280 characters. Screen Format contains 40 characters x 16 lines x 2 pages.
Screen Display Type-Ahead Buffer Memory: A 160-character buffer memory is displayed on the lower part of the screen. The characters move to the left erasing one by one as soon as they are transmitted. Messages can be written during the receiving state for transmission with battery back-up memory or SEND function.
Function Display System: Each function (mode, channel number, speed, etc.) is displayed on the screen.
Printer Interface: Centronics Para Compatible interface enables easy connection of a low-cost dot printer for hard copy.
Wide Range of Transmitting and Receiving: Morse Code transmitting speed can be set from the keyboard at any rate between 5-100 WPM (every word per minute). AUTOTRACK on receive. For communication in Baudot and ASCII Codes, rate is variable by a keyboard instruction between 12-300 Baud when using RTTY Modem and between 12-600 Baud when using TTL level. The variable speed feature makes the unit ideal for amateur, business and commercial use.
Pre-load Function: The buffer memory can store the messages written from the keyboard instead of sending them immediately. The stored messages can be sent with a keyboard command.
"RUB-OUT" Function: You can correct mistakes while writing messages in the buffer memory. Misspellings can also be erased while the information is still in the buffer memory.
Automatic CR/LF: While transmitting, CR/LF automatically sent every 64, 72 or 80 characters.
WORD MODE operation: Characters can be transmitted by word groupings, not every character, from the buffer memory with keyboard instruction.
LINE MODE operation: Characters can be transmitted by line groupings from the buffer memory.
WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.
"ECHO" Function: With a keyboard instruction, received data can be read and sent out at the same time. This function enables a cassette tape recorder to be used as a back-up memory, and a system can be created just like telex which uses paper tape.
Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.
MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.
Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.
Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.

CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.
CW Random Generator: Output of CW random signal can be used as CW reading practice. **Bargraph LED Meter for Tuning:** Tuning of CW and RTTY is very easy with the bargraph LED meter. In addition, provision has been made for attachment of an oscilloscope to aid tuning.
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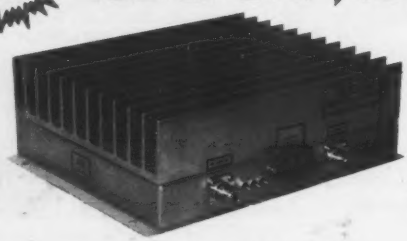

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Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2 range wattmeter (300W and 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

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Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

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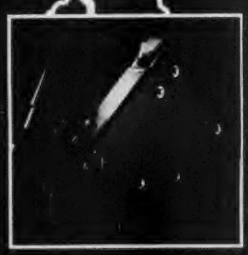

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The TU-1000 is a state-of-the-art terminal unit for RTTY that equals or exceeds the performance of most units available today. The design intent was to have a circuit that could be built easily. With a minimum of fuss, you can get on RTTY with the features and performance expected of commercial units:

- Tuned circuits employ the latest active-filter technology that eliminates bulky toroidal inductors and the need for hand-selecting components
- Input filtering ahead of the limiter prevents unwanted signals from reaching the limiter
- Continuously-adjustable shift from 50 to 850 Hz
- Only one internal adjustment required prior to operation and no selection of components needed
- RS-232 data output interfaces with modern terminals, microprocessors, code converters, or current-loop drivers
- RS-232 and relay driver output from autostart circuit
- Switchable low-pass post-detection filter for optimum results at different data rates
- Squelch circuit clamps data output in marking state when no data is present
- Data-invert switch for inverted input signals
- Sensitive input works off any audio source of at least 75 mV rms
- Automatic slicer bias compensates for signal fading

Circuit Description

Input stage IC1A is a combination high-pass filter and follower. It rolls off below 1000 Hz while presenting an input impedance of about 50k to the audio source. Thus it is suitable for connecting to the record output of many modern receivers as well as a speaker output. The high-pass filter provides at least 40-dB rejection to 60- and 120-Hz hum and ripple. The output of this stage presents a constant low-impedance source for the next stage.

IC1B and IC2A form high-pass and low-pass filters which act as a broad band-pass filter. This filter rejects frequencies outside the desired range. In the desired range of 2 to 3 kHz, response is flat within 1 dB. Outside this range, a 6-dB-per-octave roll-off occurs. Submultiples of this range are the frequencies that cause the most problems. Frequencies in the 700-to-1000-Hz range are attenuated at least 20 dB, preventing their harmonics from capturing the limiter.

IC2B is a limiter stage which has a gain of 1000. This stage delivers a constant amplitude signal to the active channel filters. Unlike some other TU designs, this limiter is self-biased, which eliminates the need for a touchy adjustment.

The channel filters consist of IC3 for mark and IC4 for space. These devices contain a 3-stage active filter with 2 tunable elements. By tuning both adjustable sections, the filter can be tuned over a wide frequency range and still maintain a uniform output level. Gain of the filters is set by divider R11/R12 and the filter input resistors R13 and R23. Filter Q is set by R21 and R35. The mark filter, IC3, is tuned to 2125 Hz with R14. With 2125 Hz applied to the input of the unit, adjust R14 for maximum signal at pin 15 of IC3. The peak-response signal level at the tuning-indicator points is 6 volts p-p. R27 is a dual 10k pot on the front panel and is the space tuning control, or shift control. I suggest using a pointer knob on the shift control with calibration marks on the panel for the 4 main shifts of 85, 170, 425, and 850 Hz.

The filter ICs have a fourth op-amp stage that is used with diodes CR1 through CR4 to form full-wave, absolute-value detectors. The mark-detector out-

When the FCC changed the rules, EIMAC was prepared for continuing HAM operations.

The FCC changed the allowable output power for linear amplifiers in amateur radio service. Hams can now run at 1500 watts PEP into an antenna. EIMAC was right there to meet requirements with its 3CX1200A7 tube.

Low-cost replacement for small spaces.

RF cabinets of many linear amplifiers currently use the EIMAC 3-500-Z tubes. The new 3CX1200A7 for design takes size into consideration and, by design, is recommended as a single, low-cost replacement for a pair of EIMAC 3-500-Z tubes for new amplifier designs.

General Specifications

The EIMAC 3CX1200A7 is a high-mu, compact, forced air cooled triode for zero-bias class AB2 amplifiers.

- 2.9" dia. x 6.0" long
- Plate dissipation: 1200 watts
- Glass chimney SK-436 available
- Standard EIMAC SK-410 socket available

More information is available on the new EIMAC 3CX1200A7 tube from Varian EIMAC, or any Electron Device Group worldwide sales organization.

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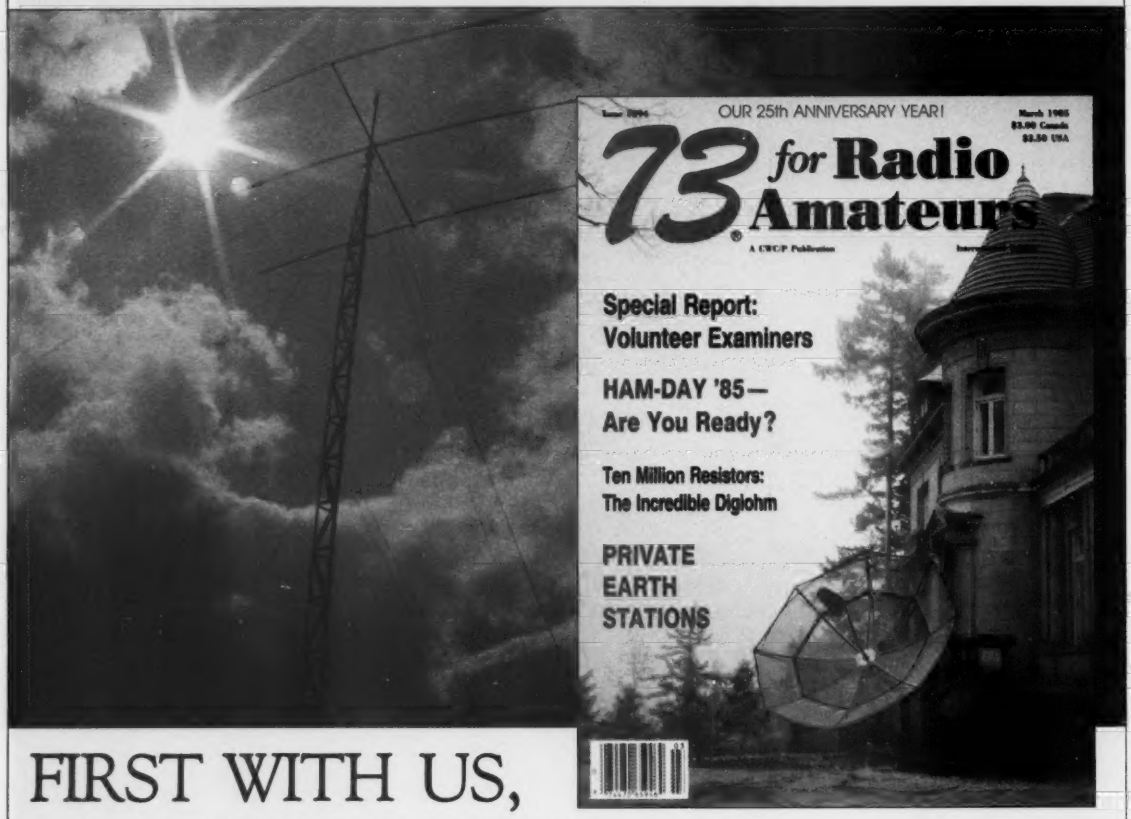

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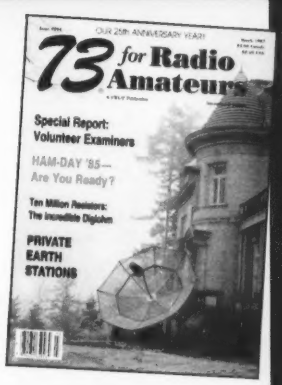

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put is a positive voltage and the space detector is a negative voltage. A small amount of filtering is provided by R18/C7 and R30/C8. The peak voltage at the filter outputs is about 3 V dc. This level is reduced to less than 1.5 volts at the summing point at the input to IC5A, so this dc-amplifier stage has been given a gain of 8 to make up for the previous signal-level reduction. The output of IC5A should be positive 10 volts on mark and negative 10 volts on space.

IC5B is a unity-gain inverter used to reverse the "sense" of the signal for "upside-down" copy with the normal/reverse switch.

Final filtering of the envelope waveform is done in IC6A. This low-pass filter is switchable for high- and low-speed data. Low speeds are 45 and 50 baud and high-speed signals are those of 74 baud and greater. (In noisy conditions, the low-speed position can be used at 74 baud with a slight increase in output distortion).

CR5 through CR8 and associated components form a circuit known as an ATC (automatic threshold corrector). This is a fancy form of capacitive coupling that automatically maintains the proper dc bias to the slicer stage when there is a level difference between the mark and space signals. It is possible to obtain perfect copy even if mark or space fades completely. I recommend switching the ATC off for unattended autostart operation and when copying multiplexed signals. This circuit has been used in TUs for a number of years and has not yet been improved upon. While use of the ATC can increase output distortion under ideal conditions, it usually is left on so that it can automatically correct the signal when conditions get bad.

IC6B is the slicer, a high-gain dc amplifier that squares up the filtered waveform. The slicer is slightly biased towards the mark side by the positive voltage from the divider formed by R54/CR9. This ensures that the TU output will idle in the marking stage when no signal is present. The slicer output is RS-232, which swings from a negative level for mark to a positive level for space. To interface to TTL circuits, you can just add a 5-volt zener diode from the output to ground, with the anode of the diode towards ground. This limits the output swing to safe limits for TTL circuits.

The output from the low-pass filter is also fed to IC7A, which sets the threshold for the autostart circuit. Like the slicer, this stage is biased towards the mark

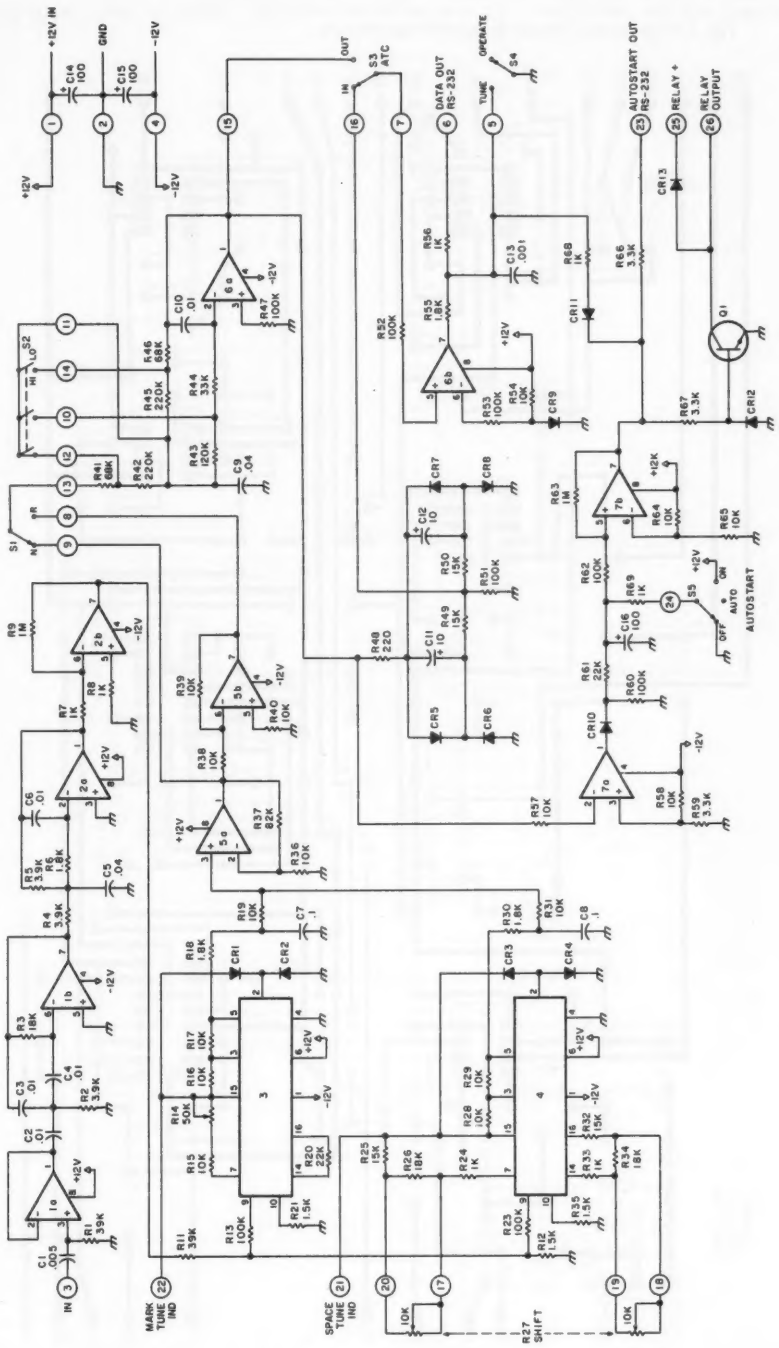

Fig. 1. TU-1000 schematic.

Fig. 2(a). Peak detector.

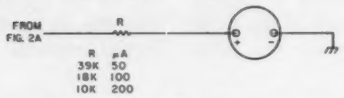

Fig. 2(c). Indicator circuit using microammeters.

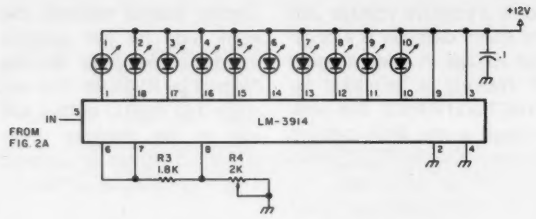

Fig. 2(b). LED indicator.

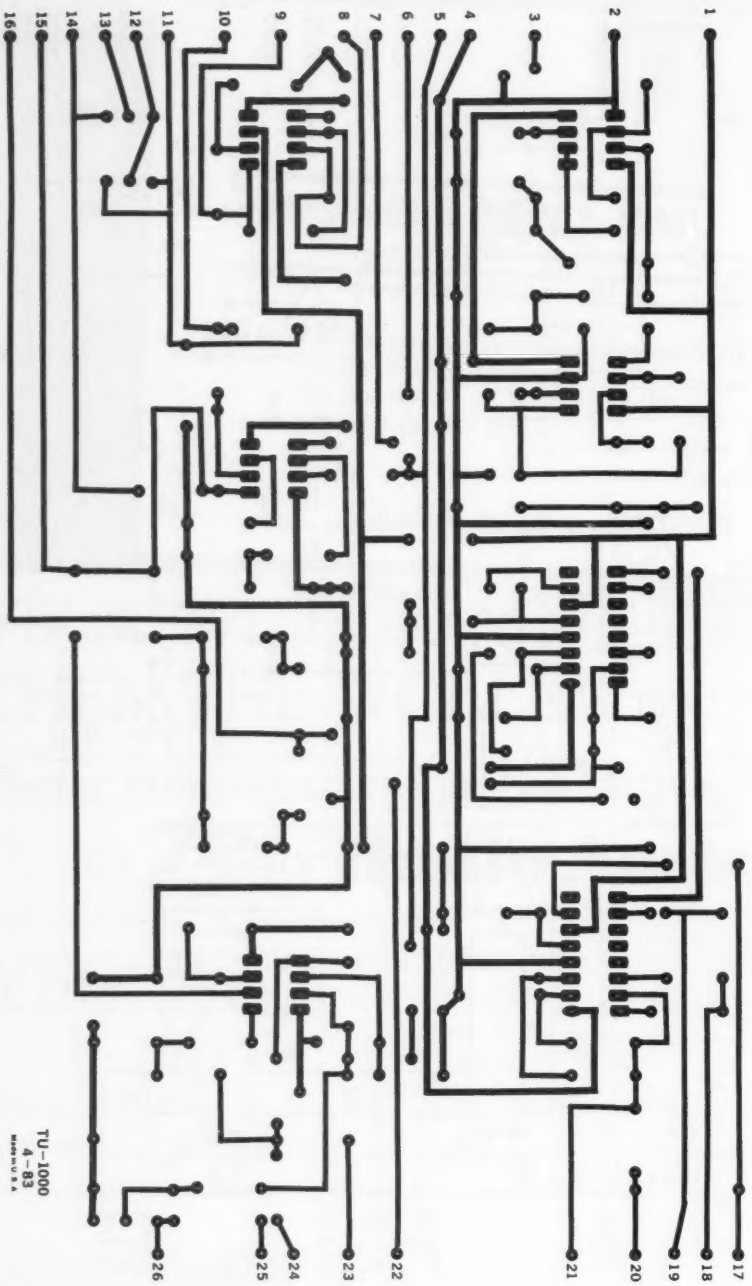

Fig. 3. PC Board, foil side.

side, only more so. This requires a fairly decent mark signal to activate the autostart. When the mark signal exceeds the 3-volt threshold, C16 will be charged via CR10 and R61. When this voltage level exceeds the 6-volt level set by R64 and R65, the output of IC7B will switch high. This output is the RS-232 autostart signal via R66. This positive level also turns on Q1, which can be used to operate a relay for motor control.

Before mark is sensed, the output of IC7B is negative. This negative source forces the data output via CR11 and R68. Spacing signals will not cause the data output to switch positive until the autostart circuit switches on. This is valuable when there is voice or other activity on the monitored frequency that would trigger the TU and cause it to print garbage. When the autostart turns on, CR11 becomes reverse biased, which permits the data output to operate normally.

When mark goes off, IC7A switches negative again. C16 slowly discharges through R61 and R60. Autostart turn-on time is determined by the RC time constant R61 × C17 and the turn-off time is (R60 + R61) × C17. With the values shown, on/off times are about 3 and 9 seconds. This ratio should be maintained so characters that have more spacing bits than marking will not cause the autostart to drop out. If you wish to change the overall timing, you can change C16. Within limits, R65 can also be changed. Reducing R65 will lengthen the times.

There are several options

for a tuning indicator. A scope may be directly connected to the indicator outputs to obtain the "cross" display. If a scope is used, it would be possible to use one of the autostart outputs to extinguish the scope beam when there are no signals to prevent a phosphor burn. Or the autostart output can connect to one of the CRT's deflection plates via a relay or high-voltage transistor to deflect the beam off the screen when the system is idle.

If you do not have a scope, I recommend one of the LED bar-graph indicator ICs like the LM3914. (A complete circuit board with LEDs included is available from Jameco.) A recommended circuit is shown in Fig. 2(b). The ac signal from the TU indicator outputs is fed to a peak detector with a fast-attack/slow-recovery time, as shown in Fig. 2(a). R3 sets the LED current at about 10 mA and R4 adjusts the sensitivity. Adjust R4 for a "full-scale" reading with steady mark and space tones on each bar-graph circuit. Remember that when a signal is tuned in and all the LEDs are on, the total current drain by both indicator circuits will be close to 200 mA.

Meters can also be used for indicators with the peak-detector circuit. I recommend 2 meters rather than a zero-center one. Try to use sensitive ones (like 200 uA or less) to reduce loading of the detector. VU meters with built-in rectifiers can be directly connected to the TU; however, they will tend to follow individual bits of the data. You will have to experiment with an appropriate value for a series resistor.

Fig. 3 is a selector-magnet driver circuit that I recommend for driving printers such as Model 15s or 28s. Ideally, this circuit should be mounted in the printer along with the 120-volt supply. This keeps the current loop physically small and reduces radiation to any receivers caused by the switching transients in the current loop. Connection to the TU should be via shielded cable to help keep out rf. Q2 does not have to be on a heat sink since so little heat is generated; it is either switched fully on or off. The Sylvania ECG-157 is also a good choice for Q2. R5/C2 suppress spikes that could damage Q2.

Performance Tests

Unlike rf or stereo equipment, there have been no real standard parameters or specifications used to compare the performance of different TUs. I decided to try to come up with some meaningful measurements that could be used.

One of the important characteristics of a TU is its ability to copy signals buried in noise. Also, if the unit has ATC, it is nice to know how well the unit does

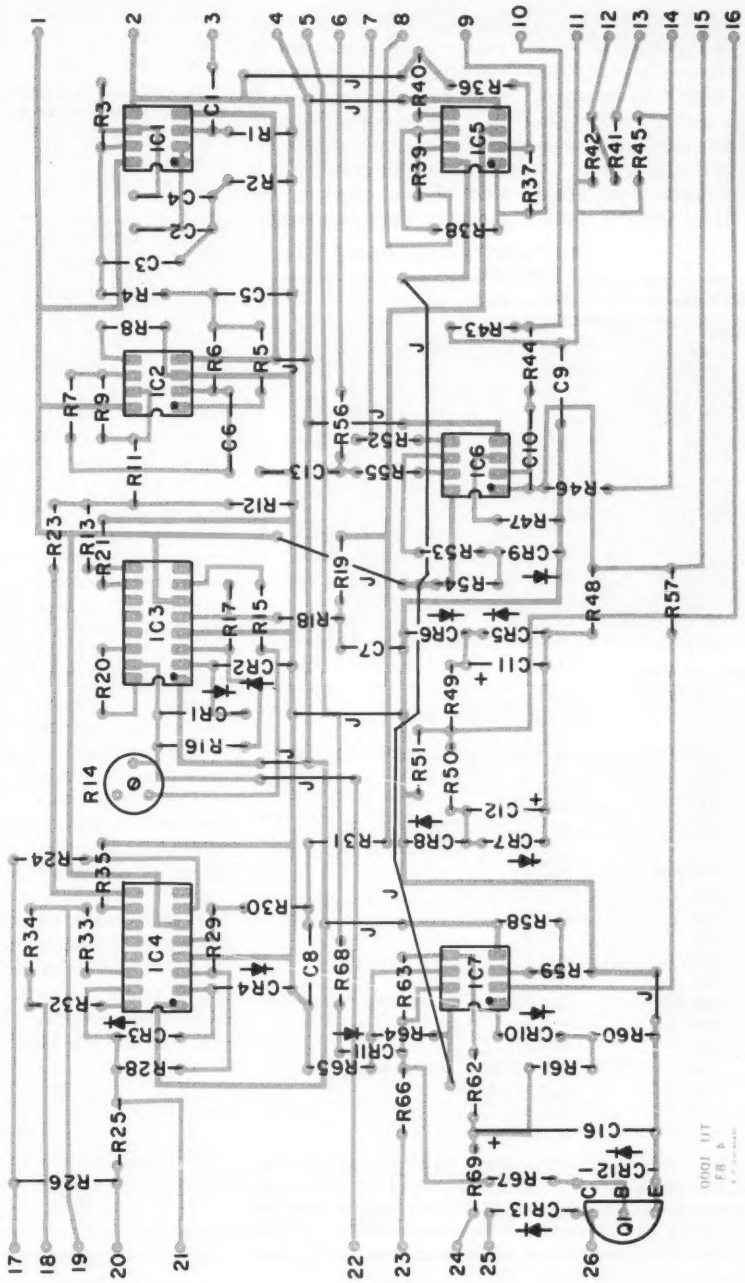

Fig. 4. Parts placement.

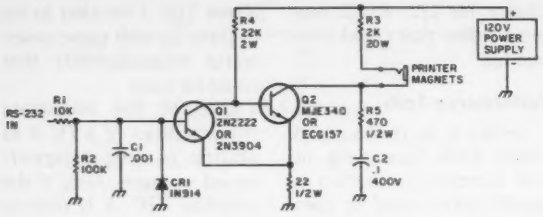

Fig. 5. Selector-magnet driver circuit.

when copying mark or space only. It is important to know how effective the post-detection filter is by determining how well it works at different data rates and how effective it is against noise.

Performance is expressed in terms of percent distortion. In TTY circuits, this means the displacement of mark-to-space or space-to-mark transitions from where they should normally occur in time in relation to the beginning of the start bit. It is kind of like checking the timing in a gasoline engine.

Parts List

Quantity	Value	Designation
Capacitors		
1	.001 uF	C13
1	.005 uF	C1
5	.01 uF	C2, 3, 4, 6, 10
2	.04 uF	C5, 9
2	.1 uF	C7, 8
2	10 uF	C11, 12
3	100 uF	C14, 15, 16
Semiconductors		
9	1N270	CR1–9 (or equivalent germanium)
3	1N914	CR10, 11, 12 (or equivalent silicon)
1	1N4000	CR13
5	MC-1458	IC1, 2, 5, 6, 7
2	AF-100-1CN	IC3, 4
1	2N3904	Q1 (or equivalent switching transistor)
Resistors (1/4 Watt)		
1	220 Ohms	R48
7	1k	R7, 8, 24, 33, 56, 68, 69
3	1.5k	R12, 21, 35
4	1.8k	R6, 18, 30, 55
3	3.3k	R59, 66, 67
3	3.9k	R2, 4, 5
16	10k	R15, 16, 17, 19, 28, 29, 31, 36, 38, 39, 40, 54, 57, 58, 64, 65
1	10k dual pot	R27
4	15k	R25, 32, 49, 50
3	18k	R3, 26, 34
2	22k	R20, 61
1	33k	R44
2	39k	R1, 11
1	50k pot	R14
2	68k	R41, 46
1	82k	R37
8	100k	R13, 23, 47, 51, 52, 53, 60, 62
1	120k	R43
2	220k	R42, 45
2	1M	R9, 63

The semiconductor devices are available from Jameco Electronics. Jameco also has a complete board consisting of the LM3914 and LEDs used for the tuning indicators (2 required) for $5.95 each. The AF-100-1CN ICs are $5.95 each from Jameco. (The AF-100 active-filter ICs were inadvertently left out of Jameco's 1984 catalog—they are still available from Jameco.)

Power-supply and miscellaneous components can be obtained from Radio Shack.

Wpm	Shift Hz	Noise dB*	Percent ATC Off	Peak ATC On	Distortion Mark Only (ATC On)	Distortion Space Only (ATC On)
60	170	−100	02	03	20	15
60	850	−100	02	04	06	04
60	170	0	05	06	24	17
60	850	0	05	07	11	07
60	170	+6	12	13	30	25
60	850	+6	12	15	18	15
100	170	−100	07	06	14	11
100	850	−100	02	03	06	03
100	170	0	09	10	20	16
100	850	0	06	07	14	08
100	170	+6	18	21	48	46
100	850	+6	27	24	27	24

*The noise level is in relation to the signal level. Distortion levels are peak values in one minute.

Fig. 6. Distortion readings.

In TTY distortion measurements, 50% is the maximum. Solid-state devices such as video terminals or speed converters using UARTs should provide perfect copy at distortion levels greater than 45%. A good Model 28 should provide solid copy at greater than 35%. Telegraph distortion, as it is called in the industry, is measured over one character length.

The distortion-measuring set I have indicates the type of distortion as well as the peak value over any period of time. Thus I can let the unit operate over several minutes of time and know the highest percentage of distortion that occurred over the entire time period.

The signal-source setup consists of a crystal-controlled, synthesized AFSK oscillator with less than 1% distortion. The output level was set to twice the voltage necessary to obtain limiting in the TU limiter stage. The noise source consists of a white-noise generator covering 0 to 20 kHz. The noise-generator output was set to be 20 dB higher than the oscillator output. The noise-generator output was connected to a precision attenuator that can be varied in .1-dB steps. The output of both signal sources was terminated in 600 Ohms and then summed and fed to the TU input. All levels were measured using a true rms meter. The AFSK oscillator was keyed by a commercial crystal-controlled "quick brown fox" test-sentence generator.

Measurements were made at 60 and 100 wpm, at 170 and 850 shift, and with no noise, signal and noise at equal levels, and with the noise 6 dB higher than the signal. Measurements were also made with the ATC on and off as well as with mark and space only with the ATC on. These last measurements were made by shorting across the mark or space filter capacitors, C7 or C8.

Like the mileage ratings on cars, actual performance may differ from the test results obtained. I connected

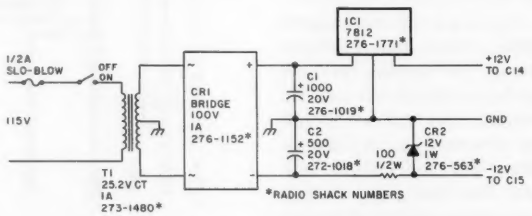

Fig. 7. Power supply for TU-1000.

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EXAMPLE: Suppose you made 10 phone calls — 9 completed, 1 busy — assume the completed calls average 20 talk exchanges each, 180 total.

You would spend 360 seconds (6 minutes!) *waiting for control* if you were using a sampling patch that samples every two seconds (180 waits × 2 seconds = 360 seconds). **It is a *severe inconvenience to have to press the button for a seeming eternity before you can be heard on each and every mobile reply.***

With **PRIVATE PATCH II** there is **no lost time waiting for control on all 9 completed calls.** However, the busy call would cause a 15 second wait for the control interrupt timer to return control to the mobile.

SUMMARY

	CONTROL WAITS	TIME WAITED
Private Patch II	1	15 seconds
Sampling	180	6 minutes

If the sampling patch has a circuit that ***"slows the sample rate when telephone audio is present,"*** the speed of acquisition is made even slower. The wait time increases, and the phone party can say perhaps 25 or more words before they can be cut off.

WHY LAND MOBILE PROFESSIONALS **AVOID** SAMPLING PATCHES . . .

The majority of radios on the market (especially synthesized and relay switched types) **do not T/R quickly enough to give acceptable results.** Often engineering level modifications are required to improve T/R response time.

The slower the T/R response time, the longer the sample must last. And of course no telephone audio is heard during the sample. ***Just noise.*** The result is ***lost words and syllables*** which are proportional to T/R response.

Acquiring and maintaining control (in order to communicate) becomes erratic when the mobile is less than full quieting. This causes *a severe loss of range.*

The base station radio can not be equipped with a linear amplifier, and operation through repeaters (that have hangtime) is not possible with a noise sampled patch.

VOX autopatches overcome each of these shortcomings. In fact, nearly all simplex patches sold in commercial service are the VOX type.

Could these be some of the reasons that the competition refers to their VOX patch as **"our favorite commercial simplex patch"**?

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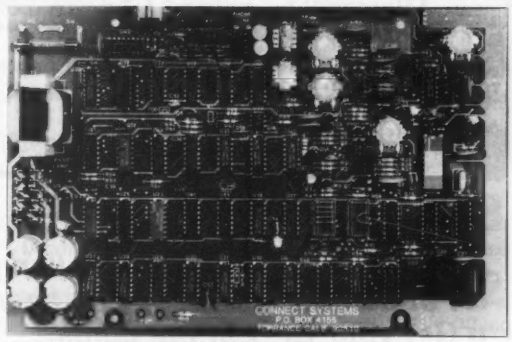

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the TU to my Model 28 and it printed 24 lines of quick brown foxes solid at 100 wpm with the ATC on and the noise 10 dB higher than the signal! At that ratio, the tones cannot be seen on a scope and can just barely be detected by ear.

I have not, as yet, figured a way to simulate QSB by reducing mark or space a given amount in a given time. All operation on the ham bands these days is narrow shift, so selective fading is minimal anyway. If fading is not too rapid, the ATC should handle most situations.

The distortion readings in Fig. 4 were all peak readings for 1 minute of operation. Note: There is little difference with the ATC on or off; however, the unit will not copy at all in the mark- or space-only condition with the ATC off.

As can be seen in the chart in Fig. 4, worst-case performance was measured in mark or space only, at 100 wpm 170 shift, with the noise at +6 dB. In all other cases the distortion was below 30%, which should still give solid copy. Notice that when the noise level is high, the distortion at 100 wpm is worse than at 60 wpm. This is to be expected since pulse widths of noise come closer to the pulse widths of the data bits. For this reason, high-speed data, like 1200 baud, is not practical in noisy conditions without error-correcting circuits.

All the ICs as well as the ready-made LED bar-graph indicator boards (part no. NSM3914) are available from Jameco. I can supply a 5" by 8" circuit board for the TU-1000 for $20.00; however, I have to get them made in quantities of 25. If you want a board, send me an SASE so I can let you know how long it will take. With the board I will include a parts list and layout drawing as well as a large schematic. ■

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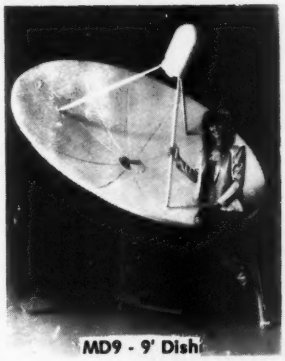
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Secrets of Telehamming

When the bands are dead, try trading your transmitter for a telephone. Operators are standing by.

Whether you live in the city in a one-room apartment or on a country estate that sits atop the highest ground around, there are times when it just isn't possible or desirable to set up your ham shack. Maybe you are a newcomer to the hobby and not yet licensed, but you are hungry to converse with those who are experienced in our hobby.

Whatever the limitations on your amateur-radio activities, or even if you are a quite active ham, recent developments in the computer field have made many elements of our hobby available without the need for amateur-radio equipment.

With nothing more than an inexpensive home computer and telephone modem, you can connect reliably with other amateurs regardless of propagation conditions or other factors beyond your control.

What kind of equipment does it really take? I recently purchased one of the popular Commodore VIC-20 computers with a program cassette recorder on the used market for $85. By adding a modem (computer talk for a terminal unit) and some public-domain software, I was on-line with thousands of fellow amateurs for well under $150. It doesn't take a $2000 system to get the job done!

Telecomputing (as it is often called) has its roots in the same technology as amateur RTTY. Both are a form of data communication.

Those of you familiar with RTTY may know that the teletype code consists of five levels, or bits. A start and stop signal are added for synchronization. Applying a little binary arithmetic, you can see that with only five bits to play with, only 32 different combinations are available. By defining two of these combinations as letters and figures, it is possible to squeak all of the alphabet, the numbers, and some basic punctuation into the limitations of RTTY code.

For some years now, a more versatile and expanded code has been used by many services. Known as ASCII (pronounced *Ask Key*, not *Ask Key Two*), this newer code exists in both a seven-bit and an eight-bit version. The extra combinations allow uppercase and lowercase and extended punctuation, and some graphics are possible, particularly with the eight-bit version.

If you have ever heard a RTTY signal, you know that RTTY is transmitted by rapidly shifting between two tones. Amateur standards call for these tones to be 170 Hertz apart, although other shifts are also common, particularly on commercial services.

The large bulk of amateur communications occur at the 60-word-per-minute speed. Data engineers refer to this as 45.45 baud or BPS (bits per second). The reason is simple. World War II surplus machines were made to operate at this speed.

Computer communications over telephone lines borrow heavily from this 40-year-old technology. Amateur RTTY technology can be applied directly to landline (telephone) transmissions. In fact, the TDD system (Telecommunication Device for the Deaf) still uses this technology. There are two major differences in most modern data transmission schemes.

The limitations of mechanical receiving units are gone forever. Computer technology makes it possible to transmit and receive information at 1200 baud or faster over a normal voice-grade telephone line. A little quick figuring shows this to be much speedier than the amateur 45-baud standard. Even at the more commonly used 300-baud speed, the increase is quite noticeable.

A different set of tones is used for computer communication. Actually, there are

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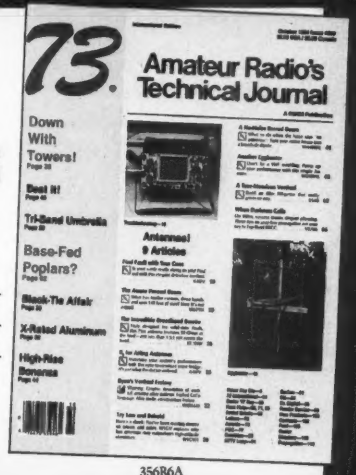

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two sets of tones separated by about one kilohertz. One set of tones is used by the originating station, while the other is used by the called station. By piggybacking these signals, two-way simultaneous communication is possible.

It isn't important that you totally understand the theory of data communications to make good use of it. Just keep in mind that both amateur RTTY and telecomputing have the same roots. You'll be a step ahead if you have a basic understanding of the similarities and differences of the two systems.

Who do you talk to once you have your computer ready to communicate with the world? Many areas have local bulletin boards, some even specializing in amateur radio. At the end of a local phone call, a host computer is connected. Most systems allow users to leave messages for each other in electronic mailboxes or to post bulletins to all users. A swap section is often included. One of the bulletin boards (BBS for short) I use even has an ongoing trivia contest!

More advanced systems allow users access to public-domain software. Downloading (as it is called) allows you to receive a program for your own use without having to manually type it in!

The most sophisticated local systems may have multiple phone lines connected to them. Such systems often allow conferencing. It's a bit like a RTTY round table without the interference!

Several national systems merit special mention. Perhaps the most popular and versatile national bulletin board for hams is HAMNET on the CompuServe Information Service Network.

CompuServe is a very large data-base operation operated by H & R Block. The host computer is located in Columbus, Ohio. During business hours, CompuServe is heavily used by commercial users. There is a rather stiff charge for use of the service during these peak usage hours.

After six in the evening local time, the rates drop dramatically, making the service attractive to the hobbyist.

The technology used in connecting to CompuServe makes extensive use of the packet transmission system. This is the same method of message exchange just beginning to be used by amateurs on an experimental basis.

At the other end of your connection to CompuServe is a bank of minicomputers. These machines are much faster and can address a much larger amount of information than your home computer can. Once you have logged onto CompuServe, you have a myriad of information available to you. By typing GO HOM 11, you will be magically taken to HAMNET!

The GO command simply tells the computer to connect you to the Home data base, page 11. That's where HAMNET lives on the system.

During your first visit, you will be offered the chance to join the SIG, or special-interest group. There is no additional charge for joining HAMNET. Standard CompuServe rates apply.

The SYSOP (short for system operator in computer terms) is Scott Loftesness W3VS. You may think of him as net control, though he may not always be on frequency. Scott's jobs are numerous. He maintains the integrity of the information in HAMNET. He must make sure that the system does not exceed its allocated memory space. He has the power to delete inappropriate messages or old files.

The amount of information available in HAMNET is a bit astounding. Among other things, an electronic version of the *W5YI Report* is available for browsing. The latest ARRL information can be found. Programs of interest to HAMNET members are available for downloading.

Just as it is on the air, perhaps the most useful service is the message section where SIG members have ongoing discussions. By using the selective retrieval options available, you can look for messages about your favorite subject. During Owen Garriott's operation, a search for STS resulted in the most up-to-date information I saw anywhere. The same can be done no matter what you are searching for.

HAMNET also has a featured guest each month. Known as the GUEST OP, it's your chance to communicate directly with some of the most well-known people in amateur radio.

Through the use of the conferencing feature, you can even talk to others on the SIG at the same time you are. Depending on how heavily loaded the system is, transmissions are delayed from just a split second to several minutes. It takes some getting used to.

Scott offers a "Hitchhiker's Guide to HAMNET." An SASE with extra postage should get you a copy. Scott's address is: 20324 Highland Hall Drive, Gaithersburg MD 20760.

A little further east is the nation's first national database operation, Source. The prestigious Reader's Digest Association is behind this one. Operation on Source is somewhat different, although the same principles apply.

Source has chosen not to implement SIGs, but rather has one gigantic message board...an electronic version of the bulletin board at your local grocery store. Each message must be assigned a category. Ham radio is one of the available categories.

Once again, the selective-search features make it easy to find the messages you are looking for.

Source also has another area that may prove to be of interest. Called user publishing, interested Source subscribers can electronically "publish" their newsletters, programs, and so on. Source will actually pay you based on how much connect time is spent accessing your work. The whole area is a bit complex, but it could offer the possibility for an on-line DX newsletter, for example.

Rates for Source are slightly higher than CompuServe but are still below $10 per hour during the evening.

There are many other free (except for the phone call) services available for amateur operators. The AMSAT Software Exchange is a good example.

For several years now, Bob Diersing N5AHD has operated a bulletin-board service for OSCAR enthusiasts. Bob comes by his hobby use of computers naturally. He is Director of Computer Services at Corpus Christi State University. To reach the AMSAT bulletin board, dial (512)-852-8194. Normal long-distance rates apply.

I should also mention that from my part of the country, the telephone circuits to Corpus Christi are very poor. This causes some problems in communicating with the system at times.

Your computer can also be used in conjunction with regular amateur equipment to accomplish similar operations on the air. Message-storage operations and program exchanges are becoming very popular.

So whether you are a computer hobbyist new to amateur radio or a ham new to computing, a whole world of information is available to you about your hobby with an inexpensive home computer and a connection to your telephone line. Forget the zoning restrictions and TVI. Telecomputing, or perhaps I should call it telehamming, may be for you! ■

Larry P. Mundinger KC4Q
10017 Westleigh Dr.
Huntsville AL 35803

CoCo's Counter

Use this dirt-cheap method to tune up your AFSK generator.

A number of recent construction articles have described inexpensive RTTY terminal units using the XR-2206 function generator to produce AFSK tones. In each case, a frequency counter is required to adjust the tones for the proper shift. Misalignment of the transmitted tones will prevent stations using very narrow filters from copying your signal and in extreme cases could get you a notice from the FCC.

Since the cost of an inexpensive frequency counter is comparable to that of a simple commercial terminal unit, it is understandable that few newcomers to RTTY are using home-brew equipment. Even if you can borrow a counter from a friend for the initial adjustment, all terminal units, whether commercial or home-brew, should be checked periodically because component values can change with age.

The Radio Shack TRS-80C Color Computer™ is an excellent choice for amateur RTTY use, and with the CoCo counter program it will even help you align your terminal unit. All that is required is a 10k resistor and an extra wire between the terminal unit and the serial I/O connector of the CoCo. These are connected to pin 11 of the XR-2206, as shown in Fig. 1, and can be left in place without affecting operation of either unit.

The program listing is shown. The first part puts the menu on the screen and POKEs the machine-language part of the program into memory. The remainder of the program takes control of two of the 6809 processor's interrupts to perform the counting function. The IRQ interrupt is driven by the field-sync output of the video-display generator and used to time a one-second interval. During this time the FIRQ interrupt, driven by the square-wave output of the XR-2206, is counting cycles. When one second has elapsed, the number of cycles counted is output to the screen by a call to a Basic ROM routine and the keyboard is polled for an input before counting again. The keyboard input allows changing the serial output so that either a mark or a space is generated. EXIT to Basic is the third menu option.

You will not get super accuracy with this method be-

Program listing.

```
100 REM* FREQUENCY COUNTER PRG
110 REM************************
120 REM*   SET UP SCREEN     *
130 REM************************
140 CLS
150 PRINT "     FREQUENCY COUNTER
 PROGRAM"
160 PRINT "","",""
170 PRINT "       FREQUENCY IN HE
RTZ"
180 PRINT "","",""
190 PRINT " S TO SET SPACE (2295
 HZ)"
200 PRINT " M TO SET MARK (2125
HZ)"
210 PRINT " E TO EXIT"
215 REM**************************
216 REM*   POKE IN MACHINE     *
217 REM*   LANGUAGE PROGRAM    *
218 REM**************************
220 FOR A = 5164 TO 5322
221 READ D: POKE A,D
222 NEXT A
223 EXEC 5164
224 DATA 204,20,158,253,1,16,204
,20,175,253,1,13,134,126,183,1,1
5,134,55,183
225 DATA 255,33,134,55,183,255,3
,134,60,183,20,201,127,20,202,12
7,20,203,125,20
226 DATA 201,38,251,134,54,183,2
55,33,204,137,76,253,1,13,204,16
0,246,253,1,16
227 DATA 204,4,140,221,136,134,9
6,183,4,140,183,4,141,183,4,142,
183,4,143,183
228 DATA 4,144,252,20,202,189,18
9,204,173,159,160,0,39,162,129,8
3,16,39,0,42
229 DATA 129,77,16,39,0,43,129,6
9,16,39,139,139,32,142,52,7,252,
20,202,195
230 DATA 0,1,253,20,202,182,255,
32,53,7,59,52,3,122,20,201,182,2
55,2,53
231 DATA 3,59,79,183,255,32,22,2
55,107,134,2,183,255,32,22,255,9
9,0,255
232 END
```

cause the field rate of a color-TV signal is slightly less than 60 Hertz and the CoCo clock is far from a precision frequency standard. My CoCo apparently runs faster than it should because the frequency readouts are about one percent low. What is important is the difference in frequency between the mark and space tones, and this can be set to within two Hertz of nominal. If you can borrow a frequency counter, you can determine the error for your computer and file it for use later when checking for drift. If you can't borrow a counter, then use the values displayed and align the demodulator to respond to your output tones. That way you will be transmitting and receiving on the same frequency. This is important in conserving spectrum space and essential for accessing any of the electronic-mailbox systems on the air.

This program could be incorporated into a general RTTY program as a menu item for use whenever desired. I will be glad to supply an assembly-language listing to anyone who sends me an SASE. ■

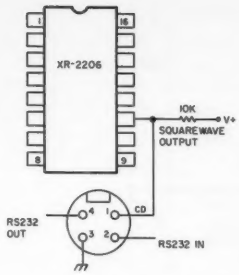

Fig. 1. Wiring diagram.

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3. "Colorful RTTY: An Advanced System for the TRS-80C," Clay Abrams K6AEP, *73*, September 1983.

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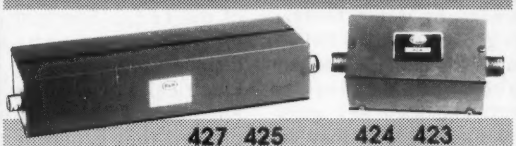

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Is Ham Radio Baking Us?

What damage occurs when human bodies are subjected to electromagnetic fields is not fully understood. Here, an expert in biostatistics examines the problem from an amateur's perspective—and offers some practical preventative suggestions.

Even if it never happens to you and me—well, hardly ever—we all joke about browbeaten hams whose neglected spouses storm into the shack periodically, demanding that they switch off "that %$#@* radio" on threat of dire consequences.

Wouldn't it be ironic if those impatient wives and husbands have actually been doing these persecuted hams a favor by dragging them away from their beloved rigs? New research into the biological effects of electromagnetic (EM) radiation is beginning to suggest that people who expose themselves to higher-than-normal levels of radio frequencies (rf) and microwaves may no longer be able to take it for granted that these exposures are perfectly harmless.

How significant is the concern? Nobody knows for sure. If there is any danger at all from the emissions of ham-radio equipment, it is neither immediate nor overwhelming: Hams aren't dropping dead by the dozen after a grueling weekend contest. However, our understanding of what rf fields do to people over long periods of exposure (like years or decades) is limited by a shortage of basic scientific knowledge about the effects of EM radiation on human cells, by the virtual absence of population-based (or "epidemiologic") data about large groups of people (like hams) who have been exposed to higher-than-usual levels of rf and microwaves for a long time, and by the vastness of a subject as wide as the electromagnetic spectrum itself.

The electromagnetic frequency spectrum ranges from extremely low frequencies (ELF) or very low frequencies (VLF) of 5 to 300 Hz, with wavelengths in the order of 10^8 meters, up through increasingly higher frequencies and shorter wavelengths. It progresses through radio frequencies from a few kHz to a few MHz, microwaves up to the 100-GHz range, infrared light, visible light, ultraviolet, X-rays, and, finally, gamma rays with frequencies of up to 10^{22} Hz and very short wavelengths in the order of 10^{-14} meters.

Ultraviolet light, X-rays, and gamma rays have quanta of sufficient energy to ionize molecules and break apart their bonds. Such ionizing radiation is known to disrupt many biological functions. Visible light (e.g., a laser beam) does damage by direct heating. Longer wavelengths (microwaves, rf, and ELF) neither have enough energy to cause ionization nor, generally speaking, are they capable of producing damage by heat. Yet it is known that weak electromagnetic fields in these lower frequencies also produce biological effects on living cells. Although these nonthermal effects are incompletely understood, they are applied in orthopedic medicine, where weak, pulsed EM fields are used in the treatment of fractures.

The Effects of Rf and Microwaves

The relatively small amount that we know about the biological effects of EM fields is based on work with test-tube cell preparations and on animal experiments. Very little work has been done to examine comprehensively the health of large numbers of humans who have been exposed to higher-than-average EM emissions.

Writing in a recent issue of the *I.E.E.E. Spectrum*, a magazine received by all members of the Institute of Electrical and Electronics Engineers, Eric Lerner explained that experiments done so far must be interpreted with caution for several reasons. For one thing, in the US most experiments are performed at 27.12, 915, and 2450 MHz—not because there is anything special about these frequencies biologically speaking, but because they are the ones assigned to medical, scientific, and industrial uses. Effects observed at these frequencies are not necessarily produced at different frequencies. He also noted that many experiments are

performed in test tubes, not in living creatures: Test-tube results are not necessarily seen in live animals.

Lerner reports that the most significant experimental finding to date suggests that microwaves can sometimes induce genetic damage in live animals. In one experiment, there was significant harm to sperm cells of male mice exposed to microwaves of 0.915, 2.45, and 9.4 GHz, and a consequent decrease in their fertility. More miscarriages than normal were recorded among their mates, and a notable increase in genetic disorders occurred among the baby mice that did survive. At 27 MHz no such changes were observed.

Microwave-induced genetic damage was also documented in experiments using insect larvae. Whether these observations have any implications whatever for human beings is anyone's guess.

Current Safety Standards

Fundamental lack of knowledge about the biological effects of EM radiation on humans is reflected both in an absence of uniform, enforceable regulations within the United States and by the diversity of standards internationally. The American National Standards Institute (ANSI) has recommended standards for EM emissions from electronic equipment at various wavelengths. However, whether manufacturers adhere to these standards is purely voluntary, and no agency monitors or keeps records of compliance with the ANSI specifications.

The ANSI standards are not the most stringent ones in the world. As seen in Fig. 1, at all frequencies the ANSI-recommended limits for exposure are much less strict than limits set in China and the Soviet Union, for example.

Within the United States, some regional governments are starting to move independently to establish their own safety guidelines. At the time of writing this article, the state of Massachusetts and the city of Portland, Oregon, have proposed standards for the general population that are five times stricter than the ones suggested by ANSI.

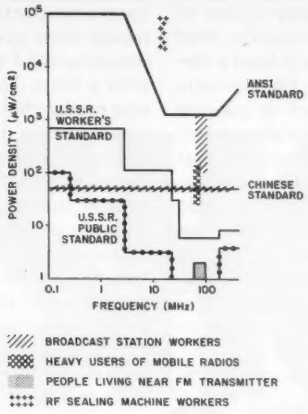

Fig. 1. Limits for exposure to EM fields. Adapted from Lerner, E. J., "The Drive to Regulate Electromagnetic Fields," I.E.E.E. Spectrum, March, 1984, pp. 63–70.

The Environmental Protection Agency is now working on a proposed standard for nonionizing EM radiation, but it will be several years, at the earliest, before this becomes federal law applicable to all national government agencies.

While the public and consumers of electronic devices may soon be covered in some American jurisdictions, occupational exposures are generally not included in anyone's recommendations. As shown in Fig. 1, workers who use rf equipment to heat and thereby seal plastic packaging are exposed to levels of rf far exceeding the ANSI recommendations. Many broadcasters work in environments heavily polluted with rf that exceeds the "safe" limits as well.

Of interest to radio amateurs who enjoy mobile operation, frequent operators of mobile transmitters have some of the highest non-occupational exposure to rf fields, coming very near to the recommended "safe" limits.

Practical Suggestions

Should we all rush to put our rigs up for sale on the next swap net and find a safer hobby? Of course not. Life is full of calculated risks. We accept the chance of an accident whenever we cross the street or get behind the wheel of a car. It is highly probable that the EM radiation from ham-radio gear is an insignificant health hazard compared to cigarette smoking—a habit that many amateurs embrace despite its proved and well-publicized dangers. There are many pastimes a lot more dangerous than ham radio: skydiving and scuba diving, for instance.

There are, however, a couple of logical and perfectly acceptable precautions that a radio amateur can take in response to the present state of uncertainty about the biological effects of EM radiation.

We already know many good reasons to avoid unnecessary, habitual QRO operation. For one thing, it is illegal here in VE-land, where regulations require radio amateurs to use the minimum necessary power during a QSO. Running QRO while chewing the rag with someone in the neighboring state clutters up the HF bands with pointless QRM and is therefore discourteous to other amateurs even half a world away.

High power also tends to aggravate TVI problems. Leaving a mobile 2-meter rig stuck on the HI power position when LO would do the job is rude because it is sometimes bothersome to other drivers' cheap car radios; running hot all the time gives the mobile transceiver itself a beating. It is just possible that wasteful QRO is also detrimental to the long-term health of the thoughtless operator, by exposing him or her to unnecessarily high doses of rf.

YL operators will be interested to know that there is no proven association between miscarriages or birth defects and low-level EM radiation, and that many scientists feel there is unlikely to be a connection. On the other hand, neither has absolute safety been proven. Logic suggests that women who are worried enough about extraneous EM radiation to avoid using visual display terminals at work during their pregnancies would probably want to avoid operating or going near ham stations too—at least during the first three months, when the fetus is most susceptible to hazardous, outside influences. Even if future research proves this precaution unnecessary, it would remove a source of anxiety now, when no answers are known with certainty.

The more time a ham spends in the shack, the more rf he or she is exposed to. Since long-term exposure over many years may be the greatest concern, it is probably fortunate that most younger operators have to work or go to school: Young people, who have the greatest number of years of exposure ahead of them, also have less spare time to in-

dulge in their hobby than do their ham friends who are enjoying amateur radio in their retirement. Older hams likely have less to worry about and may derive comfort from the case of the 90-year-old man who has enjoyed booze and cigarettes ever since he was a youth of 16. If he has survived his bad habits this long, there's little reason why he should suddenly quit now!

The Jury is Still Out

The bottom line is that we have no final answers, yet. The long-term effects of above-average, though still relatively low, levels of rf radiation and microwaves on humans are largely unknown, though they are the subject of increasing scientific investigation. To date, no one has proven definitively that a health hazard from low-intensity EM fields actually exists.

On the other hand, there is now some reason to suspect, particularly in view of animal experiments, that there could be at least a theoretical basis for concern. Most important in view of these theoretical worries: No one has yet proven that the above-average exposures incurred by ham-radio operators are harmless—no comprehensive survey of any kind has ever been carried out to compare the health of radio amateurs to the health of nonhams.

In the light of the practical experience of many thousands of radio amateurs over the years, it seems improbable that the dangers of running a ham station are really very great at all. However, in the absence of comprehensive scientific data, assumptions based on common sense, our personal experience, and what seems intuitively obvious can be misleading. In the 1950s, military "experts" told us that above-ground nuclear testing was safe, just because soldiers who witnessed these events weren't dropping dead immediately after a blast. Tragically, we now realize that it has taken two or three decades for some victims of nuclear fallout to manifest the deadly cancers that the original radiation started, years ago.

It would be alarmist and irresponsible to suggest that the emissions from ham-radio transmitters are anywhere near as noxious as nuclear explosions! But even though the scientific jury is still debating its verdict on this issue, we would be well-advised to consider that evaluating a potential health hazard is not like conducting a trial in a courtroom: Where health is concerned, it is bad policy to presume a potentially harmful agent innocent until proven guilty, because we don't get to appeal the sentence of sickness that nature may impose on us if we guess wrong.

Given so much uncertainty about the biological effects of long-term exposure to the frequencies we use in amateur radio, it makes good sense for all us hams to take a few simple precautions that scarcely jeopardize our enjoyment of our hobby. Who knows? It might even clear up some of the QRM on 20 meters! ■

Further Reading

Lerner, E. J., "The Drive to Regulate Electromagnetic Fields," *I.E.E.E. Spectrum*, March, 1984, pp. 63–70.

Lerner, E. J., "Biological Effects of Electromagnetic Fields," *I.E.E.E. Spectrum*, May, 1984, pp. 57–69.

Editor's Note: VE3KSP is a medical doctor, Assistant Professor of Preventive Medicine and Biostatistics at the University of Toronto, and a partner in Clinicom Computing Services International, Inc., of Winnipeg, Manitoba, and Toronto, Ontario, Canada.

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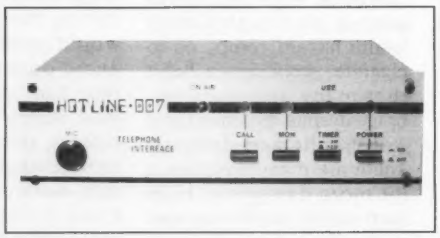

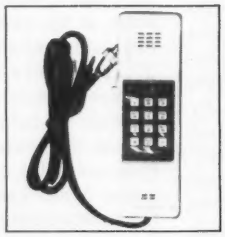

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BACK ISSUES

Robert Roehrig K9EUI
314 S. Harrison Street
Batavia IL 60510

AFSK, And Ye Shall Transceive

A sine from heaven is what you'll get when you build the AFSK-1020.

This article describes a crystal-controlled, synthesized AFSK oscillator for generating RTTY tones. There have been other articles on AFSK oscillators, but the crystal-controlled ones usually use an odd crystal that must be special ordered. The AFSK-1020 (170 plus 850 shift) is designed to use a standard source frequency of 1, 2, 4, or 8 MHz that can be derived from an on-board oscillator or taken from your microprocessor, frequency counter, or whatever other standard frequency source you may have in the shack. By selecting the type of divider IC used, you can also clock the unit from a 5-, 6-, 10-, or 12-MHz source.

The slight disadvantage with using a 1-MHz reference frequency rather than 1606.5 kHz is that the tones will not be exactly right on frequency, but they will be within 3 Hz, which is accurate enough for any application.

The AFSK-1020 will accept current-loop, TTL, or RS-232 inputs for the data signal. A down-shifted CW-ID input is provided and can be operated by either a contact closure (key) or a TTL device.

The output signal is a clean sine wave. This is obtained by running the square-wave output of the last divider through a pi-network filter. The tone levels are within 1 dB of each other. The output impedance is capable of feeding either high-impedance or 500-Ohm inputs. If a transmitter with a carbon-mike-type input is to be used, the output coupling capacitor should be increased to 10 uF, observing proper polarity. You can eliminate the 88-mH inductor and .04-uF capacitor for use with FM rigs where a clean sine wave is not of utmost importance. The remaining components will round off the square wave and reduce the harmonic content, but the filter as shown should be used if you are going to use this with an SSB rig. On FM it is best to reduce the oscillator level so that the signal is not clipped in the transmitter's audio system. A peak deviation of 3 kHz is ideal. In most cases an output level of about 25 mV rms is a good starting point.

The 1-MHz reference signal feeds a string of three programmable dividers: IC3, IC4, and IC5. The output of the last programmable divider, IC5, connects to the load input of all the dividers. This same output also connects to a D-type flip-flop, IC6. The purpose of this divide-by-two stage is to convert the narrow load pulse

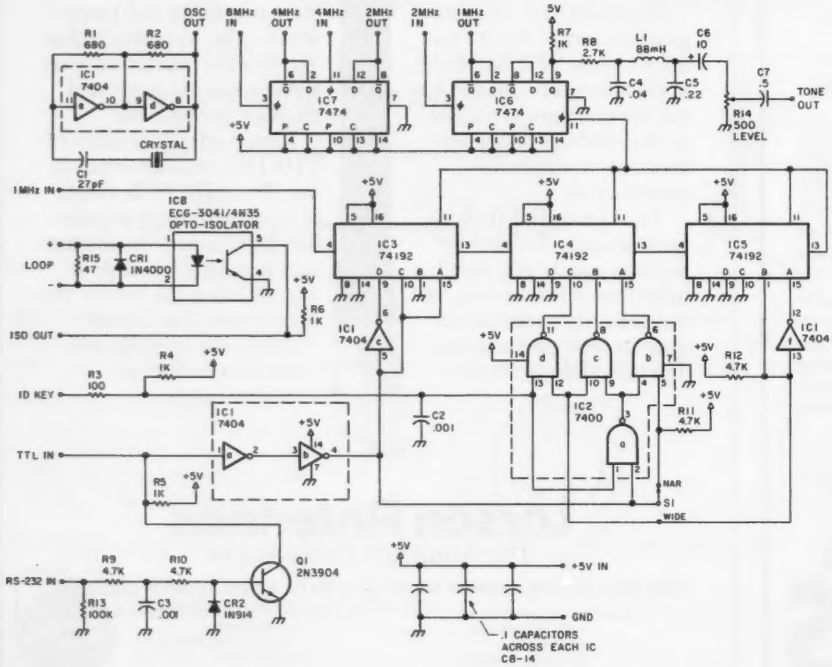

Fig. 1. AFSK-1020 oscillator.

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Freq. (Hz)	IC5 Divide by	IC4 Divide by	IC3 Divide by
1070.6	4	6	7
1269.0	3	9	4
2024.2	2	4	7
2222.2	2	2	5

Fig. 2. Divide figures for modem tones.

to a symmetrical square wave.

The binary inputs of the dividers are taken high by sections of IC1 and IC2 to obtain the desired divide ratios.

If you use a 1-MHz source, connect it to the input of IC3. A 2-MHz source would be connected to the other half of IC6, and the output of IC6 would connect to IC3. IC7 is another dual flip-flop which is used if the frequency source is 4 or 8 MHz. If you want to use 5 or 10 MHz, use a 7490 ahead of IC3. For 12 or 6 MHz, substitute a 7492. (The one half of IC6 is always used to divide the output by 2.)

IC1D and E are used as a simple but reliable oscillator circuit which will work with crystals in the 1-to-20-MHz range. If you want to use the built-in oscillator and have to purchase a crystal, specify a fundamental, parallel-mode, 32-pF-load, room-temperature crystal. You will find that 4- or 8-MHz crystals are usually $1.50 cheaper than a 1- or 2-MHz one. The additional 7474 IC needed costs less than that.

IC8 is representative of several optoisolators. It would be used for connecting the AFSK-1020 to a current loop and may be eliminated if you don't need it. The ISO OUT terminal would be connected to the RS-232 input if IC8 is used. The 1N4000 diode protects IC8 from spikes and inadvertent polarity reversals in the loop.

The RTTY rules have been changed recently so that CW ID is no longer needed for Baudot or ASCII transmissions. If you send long text or pictures, the ID is still handy so that the copy won't have printed callsigns in it. The best ID is one that shifts lower than the mark frequency rather than up towards space, as many do. This prevents the receiving machine from seeing the "key down" tone as a space. In this unit, the ID tone frequency is 2040.8 Hz.

As mentioned earlier, the derived tones are slightly off from the standard tone frequencies, but they are so close it does not matter. Mark is 2127.6 Hz, narrow-shift space is 2293.5 Hz, and wide-shift space is 2976.1 Hz.

This circuit can also be used to construct the modulator portion of a data modem. Fig. 2 shows the divide-by-n figures needed to obtain the originate- and answer-tone pairs used for 103 compatible systems. I leave it to you to figure out the connections to the divider's programming leads. ■

Parts List

1	27 pF	C1
2	.001 uF	C2, 3
1	.04 uF	C4
1	.22 uF	C5
1	10 uF, 25 V	C6
1	.5 uF	C7
7	.1 uF	C8–14
1	1N4000	CR1
1	1N914	CR2
1	7400	IC2
1	7404	IC1
3	74192	IC3–5
2	7474	IC6, 7
1	4N35	IC8*
1	47 Ohms, 1 W	R15
2	680 Ohms	R1, 2
1	100 Ohms	R3
4	1k	R4–7
1	2.7k	R8
4	4.7k	R9–12
1	100k	R13
1	500-Ohm pot	R14
1	88 mH	L1
1	2N3904	Q1
1	SPDT switch	S1

Crystal: 4 or 8 MHz, room temperature, parallel mode, 32-pF load, HC-33 or HC-18 holder (microprocessor line crystals), available from Jan Crystals for about $3.00.

* or equivalent: ECG-3041.

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Through the Looking Glass

If you could peek at a RTTY signal through magic audio glasses, what would you see? You'll find out with KN4L's Apple opus, a program that whispers, "Run me."

Scott D. Schram KN4L
225 La Prado Place
Homewood AL 35209

As I was trying to learn more about RTTY, I felt that "book knowledge" of the subject wasn't going to be enough. I wanted to actually see the marks and spaces that were being sent. That's why I wrote this program.

This program for the Apple II or Apple IIe requires input from a RTTY terminal unit (TU). The TU should output TTL-compatible voltages: high (5 volts) for mark and low (0 volts) for space. Attach the TTL output of the TU to pin 2 (Switch 0 input) of the Apple game connector. This is the same connection used for several popular RTTY programs for the Apple.

Sample outputs from the program are shown in Figs. 1

```
                    1   ********************************
                    2   *                              *
                    3   *    RTTY WAVE FORM DISPLAY    *
                    4   *            BY                *
                    5   *        SCOTT D. SCHRAM       *
                    6   *                              *
                    7   ********************************
                    8   *
                    9   *          ORG  $300
                   10   *
                   11   *   *** EQUATES ***
                   12   *
                   13   SPEAKER  =   $C030
                   14   RTTYIN   =   $C061
                   15   WAIT     =   $FCA8
                   16   *
                   17   BUFSTART =   $4000
                   18   BUFEND   =   $4FFF
                   19   *
                   20   INDEXL   =   $06
                   21   INDEXH   =   INDEXL+1
                   22   *
                   23   *   *** THE MACHINE LANGUAGE PROGRAM ***
                   24   *
                   25   * INITIALIZE INDEX TO BEGINNING OF BUFFER
                   26   *
0300: A9 00        27   RTTYWAVE LDA  #<BUFSTART
0302: 85 06        28            STA  INDEXL
0304: A9 40        29            LDA  #>BUFSTART
0306: 85 07        30            STA  INDEXH
                   31   *
                   32   *   *** LOOP, COLLECTING DATA EVERY 1/500 SEC.
                   33   *
0308: A0 00        34   LOOP     LDY  #0
030A: AD 61 C0     35            LDA  RTTYIN      ;GET MARK/SPACE DATA
030D: 91 06        36            STA  (INDEXL),Y ;SAVE IT IN THE CURRENT LOCATION.
                   37   *
030F: A9 19        38            LDA  #25         ;DELAY FOR 1/500 SEC USING APPLE
0311: 20 A8 FC     39            JSR  WAIT        ;MONITOR ROUTINE
                   40   *
0314: EE 00 04     41            INC  $400        ;FLASH INDICATOR
                   42   *
0317: E6 06        43            INC  INDEXL      ;MOVE INDEX UP ONE BYTE
0319: D0 05        44            BNE  RWI
031B: E6 07        45            INC  INDEXH
031D: 2C 30 C0     46            BIT  SPEAKER     ;CLICK SPEAKER
                   47   *
0320: A5 07        48   RWI      LDA  INDEXH      ;TEST FOR END OF DATA
0322: C9 4F        49            CMP  #>BUFEND    ;BUFFER.
0324: D0 E2        50            BNE  LOOP        ;IF NOT THE END, LOOP.
0326: A5 06        51            LDA  INDEXL
0328: C9 FF        52            CMP  #<BUFEND
032A: D0 DC        53            BNE  LOOP
032C: 60           54            RTS
                   55   *
                        ********************************
```

Listing 1. RTTYWAVE source code.

```
1  REM  RTTY WAVE FORM DISPLAY
2  REM  BY SCOTT D. SCHRAM (KN4L)
3  REM
10  HIMEM: 8192: REM  PROTECT HIRES SCREEN AND RTTY DATA
15  REM
16  REM  BSAVE THE MACHINE LANGUAGE PROGRAM AT $300
17  REM  USING THIS NAME
18  REM
20  PRINT  CHR$ (4);"BLOAD RTTYWAVE.OBJ"
21  REM
23  REM  TITLE PAGE
25  REM
30  TEXT : HOME
40  VTAB 5: PRINT  TAB( 9);"RTTY WAVE FORM DISPLAY"
50  VTAB 7: PRINT  TAB( 19);"BY"
60  VTAB 9: PRINT  TAB( 10);"SCOTT D. SCHRAM KN4L"
70  VTAB 22
80  INPUT "PRESS RETURN TO BEGIN READING : ";A$
82  REM
84  REM  THE MACHINE LANGUAGE PROGRAM DOES ALL OF THE
86  REM   READING OF DATA.
88  REM
90  CALL 768
95  REM
96  REM  DISPLAY 2 SCREENS FULL OF RTTY WAVE FORMS.
98  REM
100  FOR LOC = 16384 TO 18432 STEP 2048
110  HGR : HCOLOR= 3
111  HOME : VTAB 23
112  PRINT "EACH DIVISION IS APPROX. 20 MILLI-SEC."
114  PRINT "MARK HIGH, SPACE LOW."
116  REM
117  REM  PRINT THE 20 MILLISECOND DIVIDING MARKS
118  REM
120  FOR X = 0 TO 270 STEP 10
125  FOR Y = 0 TO 140 STEP 20
130  HPLOT X,Y TO X,Y + 1
131  NEXT Y
132  NEXT X
133  REM
134  REM  MOVE DOWN THE SCREEN AND SHOW 8 LINES
135  REM
137  FOR DOWN = 0 TO 7
138  BASELOC = LOC + DOWN * 256: REM  LEFT HAND SIDE OF EACH LINE
140  FOR X = 0 TO 279
142  REM
144  REM  ASSUME THE NEXT PLOT IS A MARK
145  REM  UNLESS THE DATA IS LESS THAN 128.
146  REM
150 Y = DOWN * 20 + 8
160  IF  PEEK (BASELOC + X) < 128 THEN Y = DOWN * 20 + 13
162  REM
164  REM  PLOT THE MARK OR SPACE
166  REM
167  IF BASELOC + X > 20479 THEN 180: REM  END OF BUFFER
170  HPLOT X,Y
180  NEXT X: REM  NEXT DOT ACROSS
185  NEXT DOWN: REM  NEXT LINE DOWN THE SCREEN
186  REM
187  REM  WAIT FOR USER TO PRESS RETURN BEFORE
188  REM  GOING TO NEXT SCREEN OR ENDING THE PROGRAM.
189  REM
190  HOME : VTAB 22
200  INPUT "PRESS RETURN TO CONTINUE : ";A$
230  NEXT LOC
232  REM
234  REM  SEE IF USER WANTS ANOTHER PLOT
236  REM
240  TEXT : HOME
250  INPUT "AGAIN? (Y/N) : ";A$
260  IF  LEN (A$) = 0 THEN  END
270  IF  LEFT$ (A$,1) = "Y" THEN 30
280  END
```

Listing 2. Basic display program.

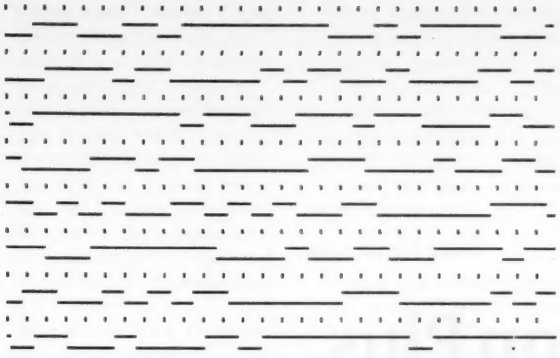

Fig. 1. Output for a 60-wpm received signal.

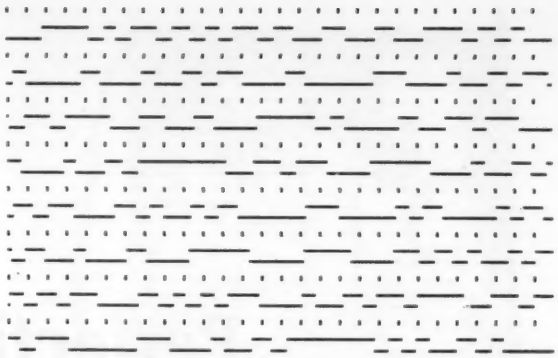

Fig. 2. Output for a 100-wpm received signal.

and 2. There are eight lines of mark/space shown, with short hash marks above each line. Note that each line repeats a little of the previous line's data to allow easier analysis. (If you don't like this feature, change line 140 to FOR X=Ø TO 255.) The hash marks are about 20 microseconds apart. The entire 8 lines represent 4 seconds of received signal.

This program presents interesting analysis possibilities. Fig. 1 is the output from a 60-wpm-Baudot received signal. The shortest mark and space lines are the data bits which are about 22 ms long. This is about what we would expect for a 60-wpm signal. Notice the glitch in the lower right-hand corner of Fig. 1. This error was caused by a static crash distorting a weak signal. You see, it is much too short in duration to be a data pulse. This might have caused an error in printout.

The 100-wpm-Baudot signal was from a very strong station, and I see no glitches in the copy. Note that the shortest data bit is about 14 ms, which is about right. This suggests that a good use for the program would be determining the speed (and code type) of an unknown RTTY broadcast.

Type in the Applesoft Basic program and save it to disk. The machine-language portion should be typed into a good assembler and assembled. (I use Merlin from Southwestern Data Systems or the assembler that comes on Apple's DOS Toolkit package. There are many other excellent ones available.) After assembly, BSAVE the code to disk under the name RTTYWAVE.OBJ. The Applesoft program loads it in automatically. If you don't have an assembler, type in the bytes from my listing and BSAVE it (BSAVE RTTYWAVE.OBJ,A$3ØØ,L$2D).

To start the program, just run the Basic program. The Basic program loads the machine-language part. You will then be presented with the title page and the prompt, "PRESS RETURN TO BEGIN READING:". Tune in the RTTY signal until your terminal unit shows proper reception, then press return.

Data will be read in for about eight seconds. A little indicator will flash in the upper-left corner of the screen to keep you from dozing off. Also, the Apple's speaker will click once per second.

Then the program will display the first screen of the waveform. Press return to see the second screen. The display portion is a little slow, but this can be improved by compiling the Basic part using any of the commercially-available Applesoft compilers. If you compile it, please observe the memory usage shown in Fig. 3.

After viewing both screens, you may read in more data or exit the program.

I hope this program benefits you. It should be a challenge to figure out the codes that some stations are using. (It is quite a challenge just to read the normal Baudot code by eye!) Perhaps you could extend this program to determine automatically the speed and code used by an unknown RTTY station. That should keep you busy.

I welcome your comments. If you wish a reply, please include an SASE.■

Address	Purpose
$0006 TO $0007	Buffer index
$0300 TO $032C	Machine code
$2000 TO $3FFF	High-resolution screen
$4000 TO $4FFF	RTTY data buffer

All other addresses are as the Apple normally uses them.

Fig. 3. Memory-usage table.

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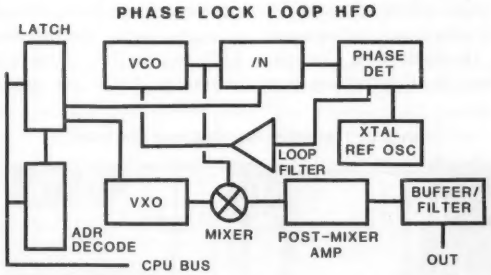

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Hamden CT 06514

In the March, 1983, issue of *73*, John Langner WB2OSZ offered an article and description of his RTTY tuner which won 1st place in *73*'s Home-Brew II Contest. It's not at all surprising that this unit won, as it is an excellent RTTY tuning device and makes tuning in a RTTY signal as easy as tuning an FM receiver with a tuning meter, as stated in the article.

I decided to give it a try. The idea of having an LED display seemed better than fussing with a dual ellipse on a scope or trying to tune a signal with the blinking LED on my TU. This LED seems to blink on almost any kind of signal within the bandpass, and trial and error becomes necessary before you tune in the right blink.

In his design, John used two Radio Shack MV57164 bar-graph displays for 20 audio frequencies (1530 Hz through 3003 Hz). Each bar graph has 10 miniature LED segments. The mark and space frequencies between 2113 Hz and 2309 Hz are in the center of the display. This miniature bar-graph arrangement would be ideal if you wanted to build it into the front panel of your TU. I decided to avoid cutting into my MVD-1000, as homemade modifications to commercial gear have a definite tendency to reduce its resale value. Building the unit in a separate enclosure with power supplies and separate LEDs seemed a better idea to me.

I used a plastic enclosure manufactured by Pac Tec

Photos by Tom Miller WA1GLS and Jeff Miller

Photo A. Completed unit on top of monitor in my shack.

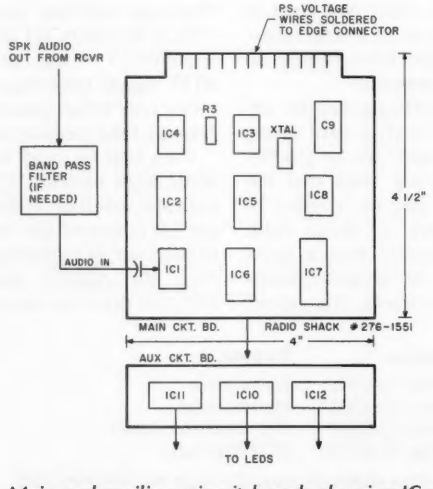


Fig. 1. Main and auxiliary circuit boards showing IC arrangement.

Corporation,[1] Model C-23K. These enclosures are available in a variety of dimensions and colors, even with a carrying handle and stand if you choose. Many manufacturers of digital test equipment use this type of enclosure as it offers great flexibility and neat appearance. The dimensions of the Model C-23K are approximately 8½" wide by 9½" deep, with expandable front and rear panel heights. The front and rear panels have three indentations along their length on the back side for trimming. Score with a sharp knife blade along the indentation you select, and then snap it off. I trimmed the front panel 2-5/8" high, and the rear panel 2-1/8".

There are plenty of mounting studs on the inside for mounting almost any shape perfboard or component needed. Those studs that are not needed or are in the way of mounting can be snapped off easily with a pair of pliers.

Since I had ample panel space, I decided not to use the Radio Shack bar-graph units. Instead, I used twenty separate LEDs manufactured by Linrose Company.[2] These LEDs are rated at 5 volts and have a built-in loading resistor, so that the 82-Ohm R-10 in the original tuner is not used. The packaged LEDs also have the little fiber mounting flange which holds the LEDs when they are snapped into a 1/4" mounting hole. This separate LED arrangement makes the complete display larger and easier to see than the bar-graph arrangements.

As shown in Fig. 4, the LEDs are mounted in 1/4" holes in a straight line across the front panel on 3/8" centers. The eight LEDs in the middle between the mark and space frequencies are red, and the six on each side are amber. The LED in the upper right corner is a green pilot. The on/off switch is mounted in the lower left corner.

The ac cord and fuse holder and a parallel phono-type input-plug assembly for the receiver output and TU input are on the rear panel. The rear panel height is cut approximately ½" shorter than the front panel to allow for ventilation.

Main Circuit Board

I used the same circuit board and IC arrangement as the author. The circuit board is a Radio Shack catalog #276-1551. It is a 4½" × 4" polyglass plug-in-type card with 1/16" grids. I did not use an edge socket, but soldered the power-supply wires directly to the edge connector.

There are also 2 bus runs around the edges, which make it convenient for supplying the plus and minus 5 volts to the ICs without running long wires to a single input point. The best feature is its cost, $3.69, which is far lower than the price I have seen for other boards of this type.

I mounted nine ICs and other components on this board. The three decoder-driver ICs are mounted on a smaller auxiliary board (Fig. 5(b)). The IC socket locations are shown in Fig. 1. If desired, you can mount all of the ICs and components on a single larger board, as there is ample room inside the enclosure to do so.

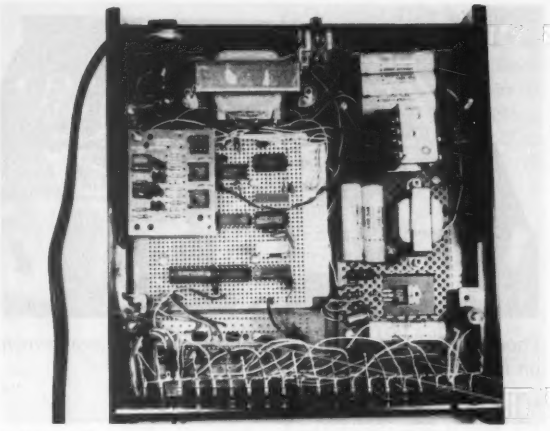


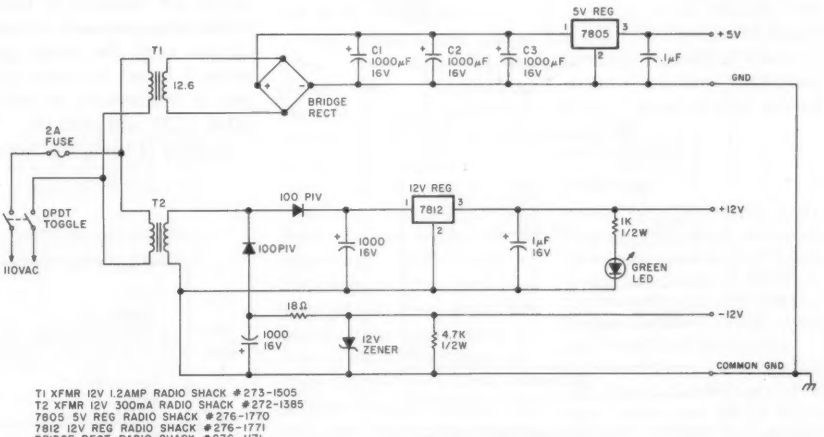
Photo B. Shows inside layout of components. Main circuit board on left with Flesher PS-170 bandpass filter mounted above it. Power-supply assembly is on the right with T2 in the center. The 12-volt regulator transistor is on the heat sink below. T1 is at the rear next to the fuse holder. LED arrangement is shown in front with leads running to the driver perfboard assembly mounted in front of the main circuit board.

Wiring

Use point-to-point wiring with single-strand insulated wire. I used the same gauge wire as Ma Bell uses in her multi-conductor phone cable.

This schematic, as shown in the original article, is correct. If you follow it exactly, the unit should work the first time. When wiring, I kept the wire lengths as short as possible without letting the wire pile up too much over the sockets. When necessary, a graceful loop around the socket is better than going directly across and piling up. Be sure to determine the location of the mounting holes in the component board first. Keep your wiring clear of the holes so it won't be pinched or broken when mounting the board to the enclosure mounting studs.

A note of advice: It's a good idea to stop and check your wiring after making four or five connections. You'll be surprised when what you thought was a correct connection actually is not. While this wiring project is not very difficult for the experienced builder, it can be tiring on the eyes, and mistakes are made easi-



T1 XFMR 12V 1.2AMP RADIO SHACK #273-1505
T2 XFMR 12V 300mA RADIO SHACK #272-1385
7805 5V REG RADIO SHACK #276-1770
7812 12V REG RADIO SHACK #276-1771
BRIDGE RECT RADIO SHACK #276-1171

Fig. 2. Power supplies.

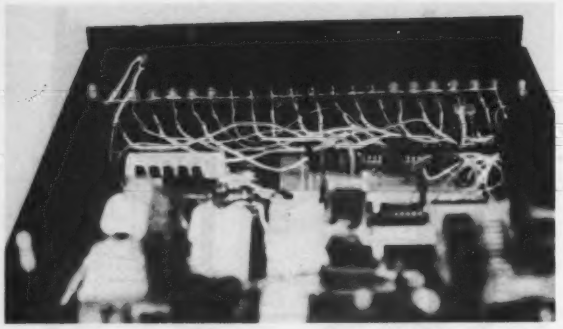


Photo C. Rear view of front panel showing LED arrangement on front panel.

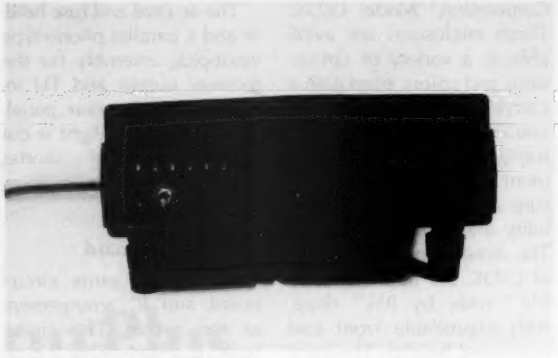


Photo D. The improved RTTY tuning aid.

ly when you are tired. Stop and check your connections frequently and when you're tired, stop—period. Then pick it up tomorrow.

Power Supplies

To power the unit, I needed regulated voltages of +5, +12, and −12. Fig. 2 shows the 5- and 12-volt power supplies. The 5-volt supply is from the *Archer Engineers Notebook*, 1980 edition. Parts are readily available. If there is a Radio Shack store in your area, they're all available there. As shown in Photo B, all power-supply components except T1 are mounted on a separate perfboard. T1 is bolted directly to the bottom of the plastic enclosure near the rear panel, next to the fuse holder. Both regulator transistors should have heat sinks. The 5-volt regulator dissipates more heat than I anticipated, so I had to add on a fancy heat-sink arrangement using quarter-inch aluminum brackets fastened together over and under the regulator.

You might prefer to build the 5-volt regulator assembly on a 1/4"-thick piece of aluminum with the 7805 regulator bolted to it for better heat dissipation. In either case, be sure to drill several small holes through the bottom of the enclosure directly beneath the regulator assembly for air-flow ventilation.

Bandpass Filter

WB2OSZ, in his article, discusses the use of a bandpass filter in conjunction with this unit. Indeed, if you are driving the tuner directly from the voice coil of your receiver, which has no audio filtering for RTTY, then a filter is desirable. I use a Kenwood TS-520SE transceiver which has no filtering of any kind for RTTY. The tuner works very well connected without a filter, but all the noise and QRM show up by the amber LEDs being lit up as well as the red ones. Ideally, only the red LEDs should light when tuning in a strong RTTY signal.

I purchased the Flesher Corporation[3] P-170 Preselector Kit. This kit, which can be powered by plus or minus 12 volts, contains a small perfboard, three ICs, and a variety of resistors and capacitors. Assembly is easy. The manufacturer supplies several "tuning" resistors, which are temporarily tack-soldered across each of four circuits until the proper resistor is found for each output at frequencies of 2420, 2000, 2320, and 2100 Hz.

Instead of using this hunt-and-peck method, I soldered in four 10k trimpots, adjusted each for peak output as instructed, and left them in the circuit. Works great! I also used IC sockets rather than soldering the ICs directly to the board.

The manufacturer's specs state a frequency response of ±½ dB from 2055 to 2365 Hz, −3 dB cutoff from 2025 to 2400 Hz, and −20 dB cutoff from 1900 to 2550 Hz.

This filter made a great difference in the display. A strong RTTY signal lit up only the red LEDs between the space and mark frequencies (2125 and 2295 Hz).

IC Layout

Figs. 5(a) and 5(b) show a top view of the IC sockets with voltage readings for troubleshooting. Do not take these voltage readings as "gospel," as I took them at random, jotting them down as I made various tests and transferring them from scribblings to some form of logic (I think).

A couple of the ICs were

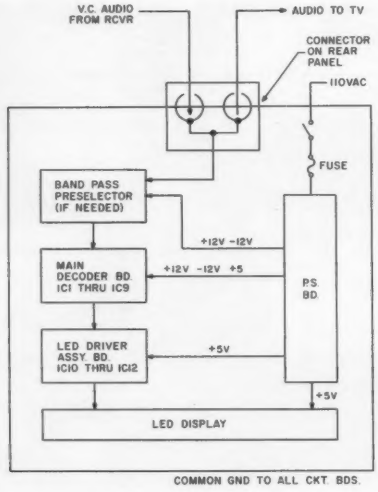


Fig. 3. Block diagram.

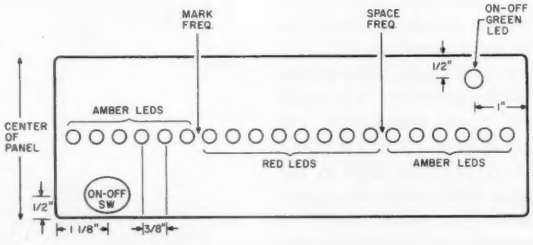


Fig. 4. Front-panel layout.

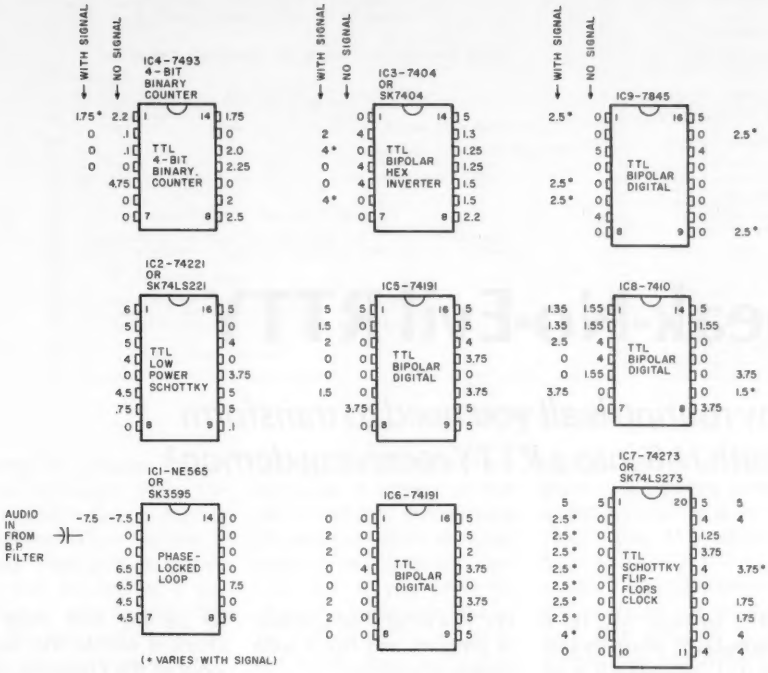


Fig. 5(a). Dc voltage readings.

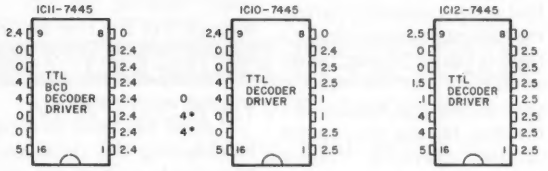


Fig. 5(b). Decoder-driver ICs on auxiliary board.

not readily available from local suppliers or in the usual catalogs. IC2 (74221) and IC7 (74273) are not listed. You can substitute RCA SK74LS221 and SK74LS273, which are readily available at a slightly higher price.

Also, SK3595 can be substituted for the NE565 (IC1). These are Schottky ICs which, according to the specs I've seen, are a more sensitive device drawing significantly less current, and so, perhaps, are worth the extra cost.

Be sure to use plenty of .01 bypass caps to ground. Bypass all power-supply voltage leads where they leave and enter each circuit board; also on the IC sockets at the +5-volt pins. These reduce the spikes which occur when the LEDs are turned on and off.

Parts List

DPDT toggle switch	
2-A 3AG fuse and holder	
T1 transformer, 12 V, 1.2 A	(Radio Shack 273-1505)
T2 transformer, 12 V, 300 mA	(Radio Shack 272-1358)
Bridge rectifier, 12 V	(Radio Shack 276-1171)
1000-uF, 16-V caps (five)	
7805 5-V regulator	(Radio Shack 276-1770)
7812 12-V regulator	(Radio Shack 276-1771)
.1-uF, 12-V capacitor	
1-uF, 16-V capacitor	
100 piv diodes (two)	
12-V zener diode	
1k resistor, ½ W	
12-V green LED	
18-Ohm resistor, 1 W	
4.7k resistor, ½ W	

Use and Conclusion

After completing everything except installing the bypass filter, I connected the unit to the output of my receiver audio and the input of the TU, plugged in the ac cord, and turned it on. The first thing I noticed was that there was no smoke: Good beginning! There was no LED display either until I adjusted R3 on the main circuit board. Then I saw some action on the LED display (random flashes). As I tuned the receiver through various signals and noise, the display indicated what I tuned in by random flashes across the entire panel. Then, as I tuned in a RTTY signal, the LEDs lit up like the traveling light display on an old movie theatre marquee, starting with the first amber LEDs, "walking" through the red, and out the other side of the amber set.

Retuning the receiver so that only the red LEDs were flashing produced a perfect copy on my TU. Works every time! You can tune in a signal as quick as a flash (pardon the pun).

Since my Kenwood has no filtering, and unless the RTTY signal is a strong one, the amber LEDs flash as well as the red, indicating QRM and noise displayed. Installing the bandpass filter, as suggested by WB2OSZ, takes care of this condition very nicely. The filter not only reduces the noise display, but makes the unit much more sensitive and the red display more positive.

The only problem I had was with an odd audio frequency oscillation which was produced when connecting the bandpass filter. But bypassing to ground the 12-volt power-supply leads with .01-microfarad caps on the filter board (directly where they enter) solved this problem nicely.

Even tuning in a weak RTTY signal surrounded by QRM is easy. Just tune between the mark and space and the TU response.

Try it, you'll like it! Tuning in a RTTY signal is now a pleasure instead of a task. It works every time and eliminates a good deal of missed copy. ■

References

1. Pac Tec Corporation, Philadelphia PA 19153. Available from Hatry Electronics, 610 Boulevard, New Haven CT 06517.
2. Linrose Company (B4302H3—Amber, B4304H1—Red). Available from Hatry Electronics.
3. Flesher Corporation, PO Box 976, Topeka KS 66601. Manufacturer states that PS-170 kit is currently limited to available stock at $15.95; PS-170A is the current version at $29.95.

Rick Bates WA6NHC
345 S. McDowell Blvd.
Suite 219
Petaluma CA 94952

Speak-No-Evil RTTY

This tiny routine is all you need to transform your Heath H-8 into a RTTY receiving demon!

If you ever wanted a short, receive-only (RO) RTTY program for your home computer or you just wanted to see what RTTY was all about, then this is for you.

By using Microsoft™ Basic (the most common Basic in home computers today) and a terminal unit (TU), copying RTTY is really very simple. I have a Heath H-8™ computer and the H-19™ terminal. My TU is a home-built, phase-locked-loop (PLL) type which is adequate for VHF (2-meters) RTTY. I have used this equipment on RTTY for about 5 years with various programs including this one. The serial card for the H-8 (and the H-89™) uses an 8250 asynchronous communication element (ACE) chip to handle the serial I/O. The 8250 is very simple to program and has a wide variety of abilities.

```
10 '    Copy RTTY ASCII to CRT program
20 '    By Rick Bates WA6NHC version 2.2A rpb
100 '   inialize the port (330 octal) for input
110 OUT 219,128 'turn DLAB on to program the chip
120 OUT 216,23  'LSB for 110 baud
130 OUT 217,4   'MSB for 110 baud
140 OUT 219,7   '2 stop bits DLAB off
150 IF INP(221)>96 THEN 160 ELSE 150    'filter the garbage
160 PRINT CHR$(INP(216));;      'print it, if good
170 GOTO 150    'go back for next character
```

Table 1.

BINARY	LETTERS	OCTAL	FIGURES	DECIMAL	HEX
00000	NULL	000	NULL	0	00
00001	E	001	3	1	01
00010	LINE FEED	002	LINE FEED	2	02
00011	A	003	-	3	03
00100	SPACE	004	SPACE	4	04
00101	S	005	BELL	5	05
00110	I	006	8	6	06
00111	U	007	7	7	07
01000	(CR)	010	(CR)	8	08
01001	D	011	$	9	09
01010	R	012	4	10	0A
01011	J	013	'	11	0B
01100	N	014	,	12	0C
01101	F	015	!	13	0D
01110	C	016	:	14	0E
01111	K	017	(	15	0F
10000	T	020	5	16	10
10001	Z	021	"	17	11
10010	L	022	)	18	12
10011	W	023	2	19	13
10100	H	024	# (POUND)	20	14
10101	Y	025	6	21	15
10110	P	026	0 (ZERO)	22	16
10111	Q	027	1	23	17
11000	O (OH)	030	9	24	18
11001	B	031	?	25	19
11010	G	032	& (AND)	26	1A
11011	FIGURE	033	FIGURE	27	1B
11100	M	034	.	28	1C
11101	X	035	/	29	1D
11110	V	036	;	30	1E
11111	LETTERS	037	LETTERS	31	1F

Table 2.

The program listing is fairly well documented so that other computer owners may adapt the main ideas to their systems. It may be rewritten so that the input is sent to both the display and the disk, but the slow speed of the operating system causes loss of characters each time it writes to the disk. If the program were interrupt-driven, then perfect copy to disk would be possible. The 8250 ACE chip is capable of interrupt operations, but I just wanted a short and simple copy program.

The most common baud rate for amateur use of Baudot (Murray) code is 45.45 (60 wpm). The first step in the program is to initialize the port (330 octal in this case) for that baud rate and then set up an array for the proper translation from binary to ASCII for the display.

The next step is to get the character from the port and to filter the garbage so that only the valid characters are printed. This is actually done by one of the features of the ACE chip. If the bits from the Line Status Register (of the ACE chip) are checked before the actual input of the character, then it is easy to filter out the garbage. In this case, we are really looking at bits 0 through 5 of the Line Status Register which show that the data has been received without any errors.

If there has been an error in receiving the data, you loop back and ignore the character in the port, which will be overwritten by incoming data. You must look at the Data Ready bit (bit 0) of the Line Status Register each time you are ready to input from the port or you will get duplicates of the last character received since the character buffer in the ACE chip is not emptied when it is read (but the Data Ready bit is zeroed). You could also use the Carrier Detect line of the ACE chip to filter out some garbage. I have my TU hardwired so that it will not send data to the port unless it sees the Carrier Detect bit set on the PLL chip.

The next part of the program checks for the FIGS or LTRS shift character. If one is found, the case label value will be changed so that the character is printed in its proper case (letters or

```
10 PRINT CHR$(27)"E"     'clear the screen
20 PRINT "RTTY (Baudot) to CRT copying program"
30 PRINT "By Rick Bates WA6NHC version 2.3B rpb"
40 PRINT: PRINT
100 '
110 '   set up port (330) octal for baudot input and data tables
120 '
130 PORT=&O330
140 OUT PORT+3,128       'set DLAB on for programming
150 OUT PORT, &O346:     'lsb for 45.45 baud
160 OUT PORT+1,&O11:     'msb for 45.45 baud
170 OUT PORT+3,4         'set for 5 bit word, 1.5 stop bits DLAB off
180 '
200 DIM L(32),U(32)      'input characters (lower and upper), 32 possible
210 FOR X=0 TO 31: READ L(X): NEXT X     'set lower case (LTRS)
220 FOR X=0 TO 31: READ U(X): NEXT X     'set upper case (FIGS)
230 CASE=0       'pre-set for lower case
300 '
310 '   input character from the baudot port
320 '
330 IF INP(PORT+5)>96 THEN 340 ELSE GOTO 330     'filter garbage
340 INCHAR=INP(&O330)    'get the character when the port is ready
400 '
410 '   set for proper case
420 '
430 IF INCHAR=27 THEN CASE=1:GOTO 300   'upper (FIGS)
440 IF INCHAR=31 THEN CASE=0 :GOTO 300  'lower (LTRS)
450 IF INCHAR=4 THEN CASE=0      'downshift on space
500 '
510 ' print it in the proper case
520 '
530 IF CASE=1 THEN PRINT CHR$(U(INCHAR));:      'print in the proper case
540 IF CASE=0 THEN PRINT CHR$(L(INCHAR));:
550 GOTO 300
1000 '
1010 '   data for lower case characters
1020 '
1030 DATA 0,69,10,65,32,83,73,85,13,68,82,74,78,70,67,75
1040 DATA 84,90,76,87,72,89,80,81,79,66,71,0,77,88,86,0
1050 '
1060 '   data for upper case charcters
1070 DATA 0,51,10,45,32,7,56,55,13,36,52,39,44,33,58,40
1080 DATA 53,34,41,50,35,54,48,49,57,63,38,0,46,47,59,0
2000 '
2010 '   variable assignments
2020 '
2030 '   case = UPPER or lower case
2040 '   INCHAR = value of character input from port
2050 '   L(X) = lower case character set
2060 '   PORT = port location value
2070 '   U(X) = UPPER case character set
2080 '   X = one time variable for set up
3000 '
3010 '   data statements - lower case LTRS (see line 1030)
3020 '
3030 '   NULL,E,LF,A,SPACE,S,I,U,CR,D,R,J,N,F,C,K
3040 '   T,Z,L,W,H,Y,P,Q,O,B,G,FIGS,M,X,V,LTRS
3050 '
3060 '   data statements - upper case FIGS (see line 1070)
3070 '
3080 '   NULL,3,LF,-,SPACE,BELL,8,7,CR,9,4,',COMMA,!,:,(,
3090 '   5,",),2,#,6,ZERO,1,9,?,&,FIGS,.,/,;,LTRS
3100 '   note that the FIGS and LTRS are case independent,
3110 '   they are the same in both upper and lower case
```

Program listing.

figures). If a space character is received, then the case label value is set for lowercase. This feature is called "downshift on space" and may be deleted if the feature is not desired. The last function of the program prints the translated character and loops back for the next character.

The data statements are the actual translated characters. Since Baudot/Murray code is limited to five bits in length, if you treat the input as ASCII, the character value is quite low (less than 32). If you print the character value from the array instead of the actual input value, then translation takes place.

While the program may not be the most glamorous, it does provide an insight into some of the tricks used when programming in Basic and the use of the 8250 ACE chip. Table 1 is added so that ASCII RTTY may be copied. No translation of the character set is needed and that program is very simple and straightforward. Table 2 is for those programmers who wish to start off with new ideas.

So, by using Basic, you can see that it is very simple to write a short routine to do almost anything. The maximum speed of this program is bound only to the speed of the Basic and the TU filters. Good luck, and see you on RTTY!

Questions will be answered only when an SASE is sent with the question. You can also find me on CompuServe 70370,523. ■

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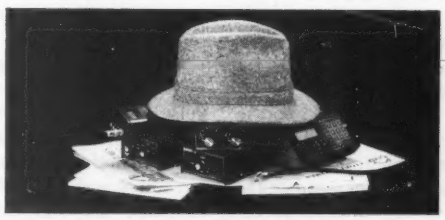

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On the Flip Side

Here's how to add reverse shift to your Kantronics Interface.

After some years of using a Model 15, a home-brew terminal unit, a tape distributor, and a Swan transceiver for RTTY, I got tired of the noise and decided to go modern. I now have a Kenwood TS-120 with the usual beam and linear, and a TRS-80C computer. I am also using a Kantronics Interface with the Kantronics Hamsoft software. I noticed right away that there were a lot of signals that were either hard or impossible to tune in so as to obtain good copy. I also hate the sight and the hot feeling of the wall-type power supplies.

On page 10 of the instruction manual there is a mention that interference or inversion of the code will prevent copy, and the operator should probably try another signal. Pages 15 and 16 of the manual describe modifications that might have to be made to increase audio level or PTT drive. Also described are modifications that are needed with certain makes of transceivers. Then, on page 18, appears the usual warning that the warranty will be void if wiring or repairs "not of our own installation" are done.

About 50 years ago, while installing early electronic gear on submarines at a local shipyard, I was fortunate to have the opportunity of working with some of the inventors and scientists who developed this gear. I have since never been completely satisfied with anything and have changed or altered everything I got my hands on, warranty warnings notwithstanding. So far I have had no trouble with warranties.

The Kantronics Interface does not have a Normal/Reverse switch, which I thought was a mistake. After adding a switch and a hex inverter, I am sure it was a mistake not to have one as original equipment. The lack of 850 or 425 shifts doesn't seem to pose any problem.

After adding the inverter circuit, I found that the many signals that had been either hard or impossible to copy were now usable.

I used one section of a 7404 hex inverter and a single-pole double-throw toggle switch. The 7404 was installed in a socket which was mounted on a store-bought printed circuit. This was attached to the rear panel of the interface with double-sided sticky tape. The toggle switch was mounted in the front panel, as shown in the photo. Press-on letters were used for the Normal/Reverse indication.

The connection between R49 and the demodulator pin on the output connector on the back panel of the interface was opened and routed through the 7404 chip and the toggle switch, as shown in the diagram. Power was obtained from a nearby +5-volt regulated source on the PC board. A nearby ground connection will also be easily found.

Operation is simple. If a signal is hard to tune or impossible to copy, flip the toggle switch and try again. There is, with a normal 170-Hz shift, the possible necessity of moving either the main tuning dial or the RIT control 170 Hz. I find that I copy more stations more easily with the switch in the Reverse position.

To obtain power for the interface without using the nasty little wall supply, I opened up the connection between pins 3 and 4 of the 4-pin mike connector on the rear panel of the unit. I then used the now-vacant pin 4 as a power source, connecting it to the positive terminal of the power-in jack. A piece of 4-conductor shielded mike cable and a similar modification to the mike jack of my TS-120, where I connected pin 4 to a regulated 13-volt bus, completes the power modification and eliminates the need for the wall supply.

A similar modification to my TR-7400-A and my TR-9000 and I am able to get on VHF AFSK in a hurry.

Flip your interface and copy the rest! 73.■

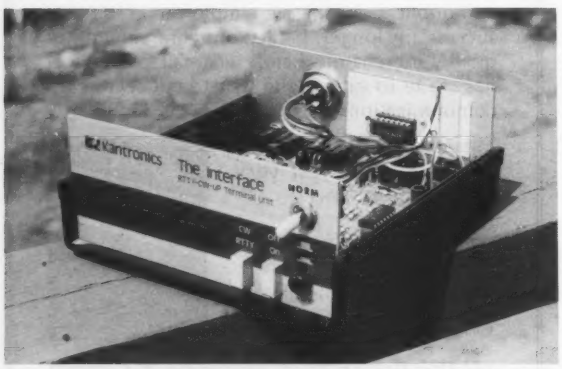

Photo A. The toggle switch is mounted on the front panel.

Parts List

1	Hex inverter	RS 276-1802		$ .79
1	DIP socket	RS 276-1993	(two)	1.29
1	PC board	RS 276-024		1.09
1	SPDT toggle switch	RS 275-326		1.99
1 pc	double-sided sticky tape	RS 64-2343		1.49
			Total	$6.65

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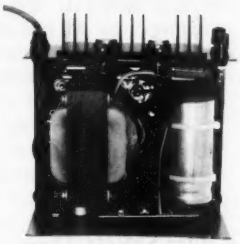

INSIDE VIEW – RS-12A

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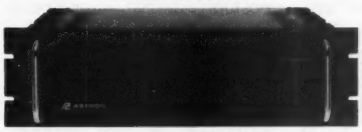
MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM-A Series



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RM-50A	37	50	5¼ × 19 × 12½	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

RS-M SERIES

MODEL RS-35M

• Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

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MODEL VS-20M

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VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

Alberto A. Sagues KA4MTO
3406 Thistleton Dr.
Lexington KY 40502

Quash QRM

Add a "RTTY Narrow" position to your TS-520's mode switch — you'll never copy hits again!

Here is a simple modification to the Kenwood TS-520SE that enables you to switch the optional 500-Hz CW filter on or off when the mode-selector knob is in LSB or USB. The performance and flexibility or operation of the rig are not impaired, but RTTY copying is greatly improved.

About one year ago, I became the proud owner of a Model 15 teleprinter and a terminal unit (TU). After making a simple AFSK generator, I started enjoying RTTY operation using my Kenwood TS-520SE transceiver. This was done by inserting the AFSK generator output into the phone-patch input of the transceiver, and transmitting and receiving in LSB. Both the TU and the AFSK generator were tuned to the 2125–2295-Hz tone pair.

A reception problem quickly became apparent. When receiving moderate to weak signals, any other strong signal within the 2.4-kHz sideband passband of the transceiver would activate the agc. This greatly reduced the detected amplitude of *all* other signals within the passband, including the one I wanted to copy. The problem was that the TU was not getting enough input of the desired signal to operate properly, and printing would usually stop. I tried turning the agc off, but that only resulted in unpleasant noises and high audio distortion. Turning the volume control up caused the undesired signal to be limited further by the limiter-input circuit of the TU, but erased the desired signal in the process. Using a passive filter tuned to the center of the tone pair and placed before the TU input helped some, but not much.

There are TUs on the market that can deal with very adverse signal combinations, but they are costly and do not fit within my ham budget. An inexpensive alternative was developed and is described below.

My TS-520SE has the optional 500-Hz CW filter. The filter can be turned on only when the mode-selector switch is turned to the CW position. If that filter could be used with the transceiver in the LSB mode, I thought, the reception problem could be greatly reduced. An examination of the vendor-supplied schematic diagram (which, by the way, lacks some details of the filter switching circuit) and some continuity measurements revealed an easy way of making the narrow filter switchable also in the sideband modes.

The method is as follows: Turn the rig off and unplug it. Carefully turn the transceiver upside-down and remove the bottom cover. The

Photos by Bob Walker KA4NPM

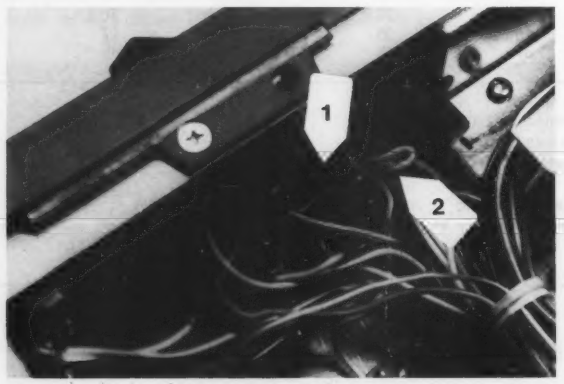

Photo A. Mode switch with modified connections: 1—short between CW and USB lugs; 2—junction of cables B and A; tape has been removed for clarity.

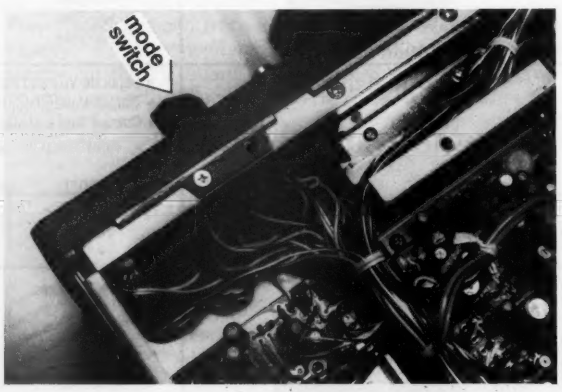

Photo B. The bottom of the TS-520SE showing the position of the mode switch.

mode-selector switch will be exposed. It has five wafers. The connections to be modified are looking straight at you. Locate the center wafer (see Fig. 1). Cable C is orange, and the lug to which it is connected has a voltage of about +14 V with respect to the chassis when the transceiver is turned on. You may want to check this by turning the transceiver on and measuring that voltage. Make sure that the transceiver is on Receive and exercise extreme care not to touch anything else with the voltmeter probe or with your hands. Turn the rig off afterwards and unplug it again; wait until power-supply capacitors have discharged.

Cables A and B are both orange-white. They connect to the LSB and USB lugs, as shown. These lugs are shorted together. Clip both A and B close to their lugs. Solder A to B as shown, and wrap insulating tape around the soldered joint. Make sure that the joined A–B cables do not interfere with the mechanical working of the switch; bend them out of the way.

Next, join the USB and CW lugs with a soldered jumper. This completes the modification. Figs. 1 and 2 show the before and after connections. (My rig has the serial no. 1010379. If yours has different color codes or parts arrangement, you should study the schematic diagram and check connections carefully before attempting the modification.) Now put the bottom cover back on and straighten up the rig.

With the mode-selector switch in LSB and the narrow filter on, tune in a RTTY signal for maximum S-reading. Switch to the wide filter and notice how the background noise and QRM increase dramatically.

The modification lets you switch the narrow filter on while in the LSB or USB mode without impairing any other normal transceiver function. For sideband operation, simply switch the filter to Wide. If you forget and leave the filter switch in the Narrow position and want to use sideband, you will notice it immediately during reception. Transmitting voice with the narrow filter on will result in an unintelligible signal but will not harm the rig. The narrow filter, when switched on, will result in a 500-Hz-wide bandpass, centered at 1500 Hz below the LSB carrier, or at 1500 Hz above the USB carrier.

To benefit from this modification, you will have to retune both the TU and the AFSK generator to an audio-frequency pair within the passband. I chose 1400 Hz for the mark and 1570 Hz for space. Leave the narrow filter on when transmitting with AFSK; its narrow bandwidth helps in putting out a cleaner signal.

The modification has made copying RTTY a pleasure, with QRM reduced to the few instances when another station operates within a couple-hundred Hz of the desired copy.

In summary, a simple modification to the filter-switching connections of the TS-520SE will make the CW filter switchable when in the USB and LSB positions. The modification involves no holes and is easily reversed. The consequent reduction in receiving bandwidth improves copy dramatically under QRM conditions. The modification does not impair the performance or operational flexibility of the transceiver. ■

Note: Kenwood TS-820S users interested in operating that unit in AFSK (instead of FSK) with 500-Hz selectivity are referred to the article by R. Rennaker W9CRC in *CQ*, Vol. 38, No. 2 (February, 1982), p. 38.

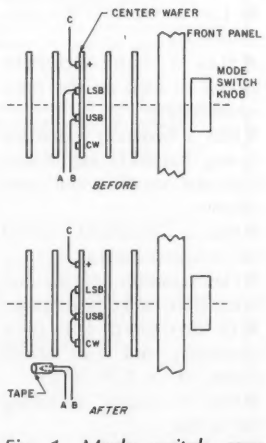

Fig. 1. Mode switch seen from the bottom of the transceiver. Wiring modifications.

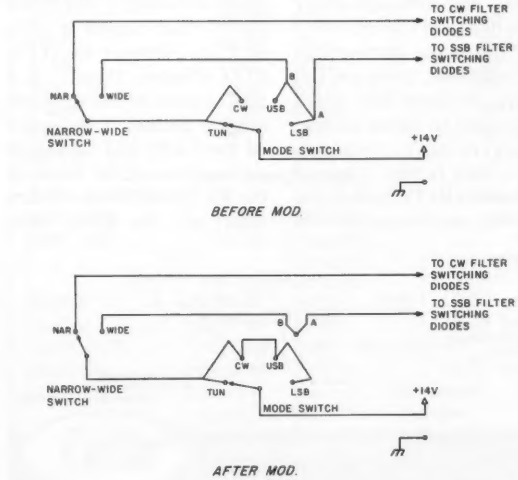

Fig. 2. Schematic of the filter switching circuit before and after modification.

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Joseph A. Ryan WB5LLM
PO Box 622
Florence MS 39073

The D-Day Demodulator

When the CV-89A joins forces with your micro, you'll take the RTTY bands by storm!

I am writing this as a result of a letter I sent to Dr. Marc Leavey WA3AJR's "RTTY Loop" column in *73*, June, 1983. It seems the procedure I used to get my computer interfaced to the receiver was of some interest. I don't think I'll alienate any of the high-tech manufacturers of RTTY demodulators with this idea.

This, incidentally, is not a review of a piece of 25-year-old equipment that got lost on the editor's desk. This is, after all, supposed to be a hobby, and although many of us like (and can afford to buy) the latest, state-of-the-art equipment, there are still plenty of hams that either don't want to spend all that money, or can't. . . especially for their hobby. I started in amateur RTTY back in the late 40s; my first printer was an old Model 12 "rock crusher" and my first demodulator was a home-brewed W2JAV converter. Eventually, via the surplus market, I obtained a surplus CV-89A/URA-8A frequency shift converter. I, like many others, became inactive for a while and when I finally got back into ham radio and interested in RTTY again, lo and behold, we had microcomputers, software, and all those goodies.

When I obtained my very first micro, a Tandy Corporation TRS-80(C) Color Computer®, and bought a copy of Clay Abrams K6AEP's RTTY software, I was all in a rush to get it on the air. Rummaging around, I resurrected the CV-89 and started to see how it could be linked to the RS-232 I/O of the CoCo. After all, the CV-89 was designed to use the old standard 130-V-dc, 0.60- or 0.20-mA loop, and that wouldn't do. Therefore, I designed the resulting interface. That's what this is all about. I won't claim that the CV-89 will pull signals out of the noise level like some of the newer high-tech demodulators are supposed to do, however, it does offer the following:

- Can copy any shift from 10 to 1000 Hz and all in between
- Can copy any speed from 45 baud to at least 300 baud, either Baudot, ASCII, or what have you
- Has a Normal/Reverse switch
- Has a Tune/Operate switch to lock up the print when tuning
- Has a two-inch scope for tuning that RTTY signal that does *not* use the usual cross pattern
- Has a Threshold control for no-signal lockup
- Has separate Narrow and Wide shift 500-Ohm inputs
- Is designed for rack mounting but can stand alone, 19" × 5.5" × 15"
- Has 17 tubes, including the scope

For the going prices at most hamfest flea markets or from some of the remaining surplus radio suppliers, usually between $50.00 and $85.00, what could be better?

I should warn you at this time that one of the tubes used, the 1Z2, is to my knowledge in very short supply. However, since it's a diode used as a high-voltage rectifier for the scope, and mine went west several years ago, it can be replaced, with some loss of focus on the scope, with any silicon diode with a 1000-V piv rating. At the time of writing, the scope, the CV-89, and the 1Z2 were all available from Fair Radio Sales of Lima, Ohio. However, the designers of this unit saw the possibility of this scope tube being in short supply and made provisions for an external connector on the rear apron that can be used to connect any oscilloscope. This will give the same display pattern, so loss of the scope tube (a 2BP1) is not serious.

Let's get down to the important part, the interfacing of this unit to the TTL I/O of a computer's RS-232. That RS-232 doesn't want to see more than 10 V dc, and the keyer tube of the CV-89 is designed to switch 130 V dc. What to do? Well, the prob-

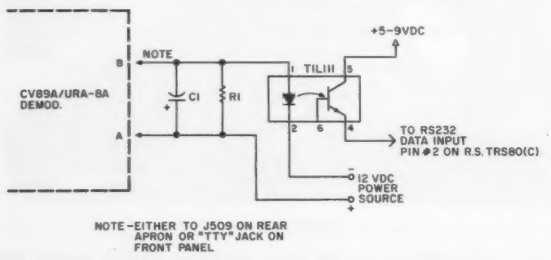

Fig. 1. Schematic.

lem is solved with the use of an Opto-Coupler (I used a Radio Shack TIL-111) and a 12-V-dc power supply. Yep, the 6AQ5 keyer will nicely switch the 12 V dc and deliver 0.20 mA to the LED side of the Opto-Coupler (which is what it wants to see, anyway). (See Fig. 1.) I added an RC circuit to compensate for some leading-edge bias on the signal caused by the low plate voltage (I found that 100 uF @ 10 V dc and 120 Ohms work best). On the TTL output of the Opto-Coupler, I used 9 V dc and connected it to the input of the RS-232. Presto! It's been working fine for the last year and I can copy anyone I can hear, at any shift (and believe me, they vary all over the place) and any speed from 45 baud to 300 baud ASCII (not much of that on right now).

A little more about the CV-89, itself. All the tubes in it (except the 1Z2 and the scope) are standard off-the-shelf items like 12AX7s, 12AU7s, 6AQ5s, 6AL5s, and 0A2s, and all the other components (except the filter coils) are standard resistors and capacitors, so don't be afraid of it. All these parts are going to be around for awhile. I should mention that the CV-89 comes (usually) with a blower and a thermal switch designed to cut in at 120° F; however, in over 10 years of use, it has never cut in (I even checked it out by purposely heating the thermal switch up, and it worked).

Maybe this is not a lash-up that is state of the art, but in all the years of use, the CV-89 has not lost a tube (except the 1Z2) and is still in use. I know that many hams pooh-pooh tubes these days, and I know it's a bit bigger than the small solid-state demodulators, but it works as well and it's inxpensive. Try one . . . you may be surprised! ■

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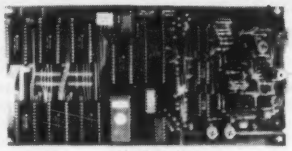
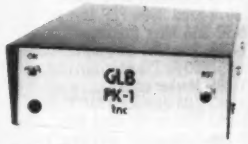


MODEL PK1
(Shown with 14K RAM and 8K ROM)



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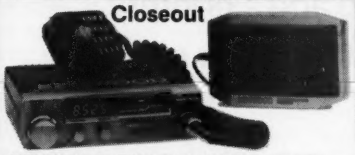

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A couple of years ago I had a chance to buy a Teletype® Model 33 ASR. I had previously purchased a VIC-20 and when I was told the 33 was also an ASCII device, I figured it could be used as a printer (somehow!). I had read the programmer's guide[1] enough to know that there was a user's I/O (input/output) port and a built-in RS-232 interface. First I built a teletype interface and then tried to get it to work. I'll tell you how I did it and in the process try to explain the mysteries of the user's I/O port. The Model 33 is now usable to both run and list programs. Except for slow speed, no graphics, and noise, it's a perfect printer. (Well, what do you expect for $50?)

When I bought the Model 33, I only knew it was 110 baud and had a 20-mA loop to operate the print magnets. If I had had any idea that I would need to know how many stop bits were required, as well as parity, word length, and if full or half duplex, I don't think I would have started the project. But getting there was half the fun.

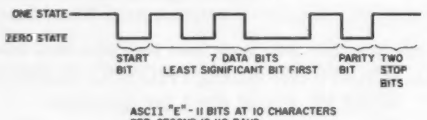
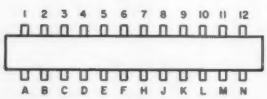


Fig. 1.



Pin #	Type	Note	Pin #	Type
1	GND		A	GND
2	+5V	100 mA max.	B	CB1
3	RESET		C	PB0
4	JOY0		D	PB1
5	JOY1		E	PB2
6	JOY2		F	PB3
7	LIGHT PEN		H	PB4
8	CASSETTE SWITCH		J	PB5
9	SERIAL ATN IN		K	PB6
10	+9V	100 mA max.	L	PB7
11	+9V		M	CB2
12	GND		N	GND

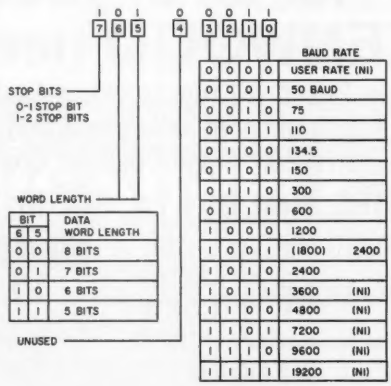
Fig. 2.

Since then, I have found a book[2] that explains the teletypewriter data format (see Fig. 1). As you can see, there is a start bit, seven data bits, a parity bit, and two stop bits for each character. The VIC I/O port must translate each ASCII character to this format and operate our external device (a transistor switch) to interrupt the 20-mA loop in this pattern to print each character. It sounds like a lot of work but the biggest share is done by a smart I/O chip called a VIA (versatile interface adapter). This chip will format inputs and outputs to the VIC in serial or parallel format (the 33 is serial). Also, it automatically takes care of those pesky stop bits, etc.

The VIA uses the bottom side of the user I/O port. The arrangement is shown in Fig. 2. We will be using a serial device so we will only need to operate a switch to make the printer work. We will use contact M, called CB2. This is called the three-wire mode since only three wires, a send, a receive, and a common, are needed. Of the three, we will use only the send (CB2) and the common. Receive would be through CB1 and common.

You must do two things to get the port to operate. First, you must tell the computer you want to direct data through the port. To do this, the Basic command, Open, is used. This command has the format: Open file #, device #, command #, and string. The Open command will be as shown on line 10 in the program listings.

Our Open command will use file number 200. Any file



BIT 6	BIT 5	DATA WORD LENGTH
0	0	8 BITS
0	1	7 BITS
1	0	6 BITS
1	1	5 BITS

Fig. 3.

number from 1 to 255 could be used but numbers above 127 generate an automatic line feed after the carriage return. Because of the line-feed generation, no buffer or handshaking is needed.

The next number, 2, is the device number that says it's an RS-232 device. This turns on CB2 for us. The third 2 is the command number and has no effect on our printer. The string at the end is the real workhorse and was the hardest to figure out. The first part, CHR$(163), directs the VIA's control register. It tells the speed and format of the serial ASCII data. 163 in decimal is 10100011 in binary.

Fig. 3 shows the control-register format with our bit pattern for 163 above it. As you can see, we are telling it to use two stop bits, a seven-bit word length, and a 110-baud rate. The second part of the string is CHR$(220). This is automatically peeled off and used to control the command register. 220 in decimal is 11011100 in binary. Fig. 4 shows the command-register format with our bit pattern above it. You can see there is parity disabled, half duplex, and we are using the three-line mode.

The only other line we need is line 20 in program listing 1. Get A$ will check what would normally go to the screen and hold it for the CMD(200). The CMD(200) says take the data which would normally go to the screen and send it to file 200. Check back to our first line and you will see we made file 200 the RS-232. That's it! I start my programs like that:

I use 100 for my first actual program line number. When I RUN, the output will go to the printer instead of the screen. To save paper, use RUN 100 to bypass the printer instructions and use the screen as always. After a RUN, type LIST and your program will list on the printer. If you have a lengthy printout and you want to test the program or just want a listing, put a line 30 STOP and then RUN the program. The printer will just print BREAK IN LINE 30 and you may then list the program by typing LIST.

The interface I used is shown in Fig. 5. The circuit was taken from a *QST* design.[3] I used this circuit because, with proper programming, the optoisolator would allow inputting the VIC by typing on the 33 when the VIC was used in the three-wire mode. This might be useful for a printer remote from the shack or for a two-operator station. For use as a printer only, the optoisolator is not needed.

The 20-mA loop in the 33 may be hard to find. I found mine by tracing the wires, opening the circuit, and metering the 20-mA current. Of course, asking someone who knows and can show you is always the best way!

```
10  OPEN 200,2,2,CHR$(163) + CHR$(220)
20  GET A$:CMD(200)
100 PRINT "WHAT IS YOUR NAME?"
110 INPUT N$
120 PRINT N$
130 PRINT "WHERE DO YOU LIVE?"
140 INPUT L$
150 PRINT L$
160 END
```

Program listing 1.

```
10  OPEN 200,2,2,CHR$(163) + CHR$(220)
20  OPEN 3,3
30  GET A$
100 CMD(3)
110 PRINT "WHAT IS YOUR NAME?"
120 CMD(200)
130 INPUT N$
140 PRINT N$
150 CMD(3)
160 PRINT "WHERE DO YOU LIVE?"
170 CMD(200)
180 INPUT L$
190 PRINT L$
200 END
```

Program listing 2.

```
10 OPEN 200,2,2,CHR$(163) + CHR$(220)
20 GET A$:IF A$ ""THEN 20
30 IF A$ CHR$(13) THEN PRINT CHR$(10):CMD(200)
40 PRINT#200,A$;:GOTO 20
```

Program listing 3.

When you get your interface built, try the program in listing 1 to test your new printer. Type RUN and the first question will come up on the screen and be printed on the 33. When you type your answer, note that you retain all the features of the screen editor like DELETE and INSERT. Your run should look like this:

WHAT IS YOUR NAME?
(Your name)
WHERE DO YOU LIVE?
(Your town)

The program may be listed by typing LIST. Also try RUN 100 to get the feel of manually bypassing the printer instructions.

For an expanded sample, try the program in listing 2. This program acts as a print switcher. It prints both the questions and answers on the screen but only the answers on the 33. I have modified a code contest program to print a log of all contacts on the 33 and return to the VIC automatically to con-

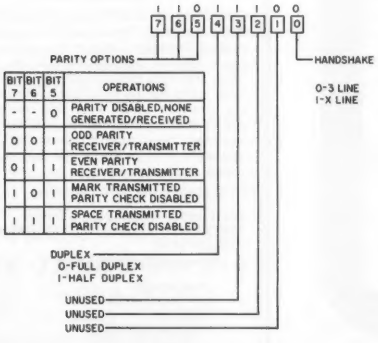

1 1 0 1 1 1 0 0
7 6 5 4 3 2 1 0
PARITY OPTIONS
HANDSHAKE
BIT 7 BIT 6 BIT 5 OPERATIONS
- - 0 PARITY DISABLED,NONE GENERATED/RECEIVED
0 0 1 ODD PARITY RECEIVER/TRANSMITTER
0 1 1 EVEN PARITY RECEIVER/TRANSMITTER
1 0 1 MARK TRANSMITTED PARITY CHECK DISABLED
1 1 1 SPACE TRANSMITTED PARITY CHECK DISABLED
0-3 LINE
1-X LINE
DUPLEX
0-FULL DUPLEX
1-HALF DUPLEX
UNUSED
UNUSED
UNUSED

Fig. 4.

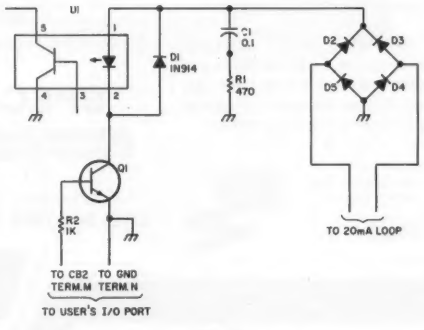


Fig. 5.

tinue the code-generating portion of the program.

For a last example try the program in listing 3. This will allow you to type on the VIC and have the text print on the 33. This might be useful with a RTTY program and would give you hard copy of both the send and receive from the VIC keyboard.

I hope this will give new life to a 33 in someone's basement corner. Maybe that 33 at the next hamfest won't look quite so antique! Don't be afraid to experiment with the user I/O port, just keep in mind that it is at TTL levels instead of the normal RS-232 levels of plus and minus 15 volts. I also hope this information on the user I/O port will spur you on to use the computer for other projects. In the meantime, you have a cheap printer for the VIC.■

References

1. *VIC 20 Programmer's Reference Guide*, A. Finkel, N. Harris, P. Higginbottom, and M. Tomczyk, Commodore Business Machines, Inc., and Howard W. Sams and Co., Inc., 1982.
2. *6502 Assembly Language Programming*, Lance A. Leventhal, Osborne/McGraw-Hill, 1979.
3. "A State-of-the-Art Terminal Unit for RTTY," Michael J. DiJulio WB2BWJ, *QST*, December, 1980.

Parts List

C1—0.1 μF, 50 V disc
R1, 2—¼ Watt
D2—1N914
D2, 3, 4—1N4003
Q1—2N5655, MJE340, TIP-48, or ECG198
U1—OPI-2150, HEP-P5000, or Motorola 4N28
Misc.—DIP socket, transistor socket, perfboard, etc.

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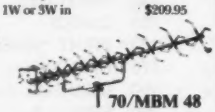

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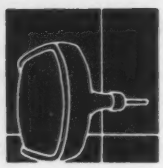

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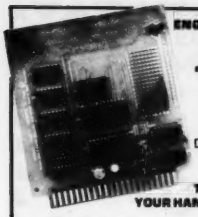

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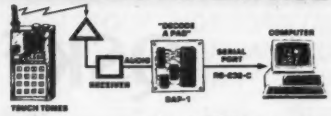

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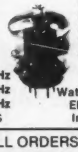

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Want a vfo modification which gives you full break-in keying and takes about one hour to install? It worked wonders for my vintage 1948 vfo. Well, read on! I have a simple circuit which can remotely alter the output frequency of Hartley- and Colpitts-type oscillators. The frequency can be shifted at normal CW keying rates and the difference in frequency can be several thousand Hertz.

The circuit was developed to bring an antique vfo (Millen type 90711) out of mothballs and place it into active service. As with many older style units, this vfo had to be switched into the standby mode while listening to the other side of a CW conversation to avoid an annoying heterodyne whistle. The whistle resulted from fundamental or harmonic emissions coming from the oscillator. When reenergized, the oscillator had a tendency to drift until its temperature had restabilized. This old vfo could also be operated as a keyed oscillator (i.e., the oscillator could be turned on and off when keying the transmitter). As expected, keying the oscillator provided a truly wretched chirping output signal which was not very useful.

Many amateurs have known that it is better for the sake of stability to let an rf oscillator run all the time. However, it is next to impossible to completely shield the oscillator compartment to prevent leakage of fundamental and harmonic frequency components. Thus some interference to the station receiver will remain. A more practical solution involves shifting the vfo to a new frequency which does not create severe reception difficulties. Although several circuits exist which can shift a vfo's frequency, many are not well suited for full break-in CW keying.

Fig. 1 illustrates an rf switching circuit and its connections to a typical multistage vfo or master oscillator/power amplifier transmitter. This circuit is controlled by the key to shift the oscillator frequency at a normal keying rate. It can be added to many vfo's without much revision since it is connected in parallel with the existing components. Control voltage for the circuit was derived from the key connections inside my vfo. When the key was up, slightly over 100 volts appeared across my key contacts. This voltage is used to bias a solid-state rf switch into conduction with R2. The rf switch consists of D1, Q1, R1, and C1. When the key is up, as for receiving, capacitance from C1 is added across the oscillator's tuned circuit, which was tuned near the 160-meter band in my case. When transmitting, the net capacitance of the rf switch drops to a minimum. Hence, when transmitting, the vfo frequency should return to nearly the same frequency as for the unmodified vfo, thereby maintaining the original dial calibration.

A rigid arrangement should be used for the sake of stability. I located the components adjacent to the tuned circuit. Component leads were soldered directly together to minimize stray capacitance. An NPN transistor was selected in my rig as in Fig. 1 since the keyed voltage was positive. However, D1 could be reversed and Q1 could be a PNP type if a negative voltage were present.

I found that it was not necessary to realign the vfo oscillator after modification. The intrinsic shift created by this circuit when the key was down was slight as expected. However, if the circuit does not move the oscillator outside the receiver's passband when shifted, the value of C1 may need to be increased, but not by much. Increasing the capacitance of C1 can cause a larger drop in the oscillator frequency. However, too much capacitance may stop the oscillator altogether, which is very undesirable and may be damaging.

The shifter is easy to use. Firstly, open switch S1 to locate the oscillator fundamental or harmonic emission with your receiver (SPOT). Next, tune the vfo to zero beat its emission with an incoming CW signal or just set it to a comfortable tone (inside the band limits, of course). Lastly, close S1 and you are ready to transmit (OPERATE). Be sure to either use a separate antenna or fast-acting antenna switch for the receiver to keep the smoke to a minimum in your shack. ■

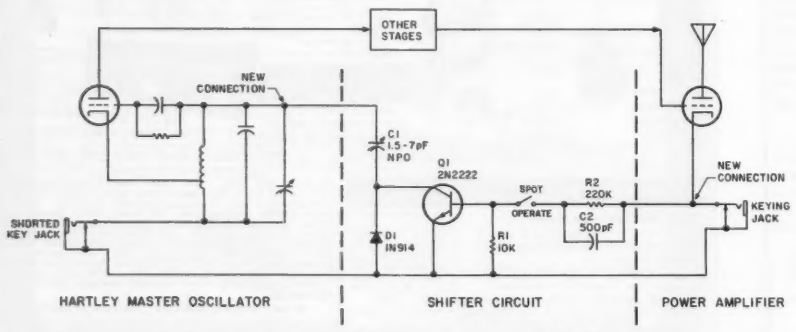

Fig. 1. Simple add-on circuit to shift vfo frequency at normal CW keying rates for full break-in keying.

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MRF450	50W	12.00	27.00
MRF450A	50W	12.00	27.00
MRF453	60W	15.00	33.00
MRF453A	60W	15.00	33.00
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MRF454A	80W	16.00	35.00
MRF455	60W	12.00	27.00
MRF455A	60W	12.00	27.00
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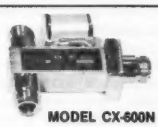
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Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

BLACKSBURG VA
MAY 30—JUN 1

Virginia Polytechnic Institute and State University will hold a workshop, Personal Computer and STD Computer Interfacing for Scientific Instrument Automation, on May 30–June 1, 1985, at Virginia Tech, Blacksburg VA. The hands-on workshop, directed by Mr. David E. Larsen and Dr. Paul E. Field, is $450.00 for three days. Participants will be wiring and testing interfaces. For more information, write Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg VA 24061, or phone (703)-961-4848.

SEASIDE OR
MAY 31–JUN 2

The North Coast Repeater Association and the Oregon Tualatin Valley ARC will sponsor the fifth annual Oregon State Ham Convention from May 31, 1985, through June 2, 1985, at the Seaside Convention Center, Seaside OR. The convention hall hours will be: Friday, May 31—5:00 pm to 8:00 pm; Saturday, June 1—8:00 am to 5:00 pm; Sunday, June 2—9:00 am to about 2:00 pm. The convention will feature commercial/dealer exhibits, seminars, VE testing, a flea market, and a banquet. For more information, contact OTVARC, PO Box 5132, Beaverton OR 97006.

LOVELAND CO
JUN 1

The Northern Colorado Amateur Radio Club will hold Superfest 7 on Saturday, June 1, 1985, at the McMillen Building, Larimer County Fairgrounds, Loveland CO. Admission is $3.00. Events include a code contest and packet radio. Doors open at 8:30 am. There will be food and commercial exhibitions available. Talk-in on 146.25/.85 and 147.795/.195. For more information, contact Rick Hubbard WA0DDC at (303)-353-8366, or Gus Fox W0EE at (303)-330-9012.

ST. PAUL MN
JUN 1

The North Area Repeater Association will sponsor a swapfest and exposition for amateur-radio operators on Saturday, June 1, 1985, at the Minnesota State Fairgrounds, St. Paul MN. Admission is $4.00 in advance and $5.00 at the door. Exhibits, commercial dealers, VE exams, and a giant outdoor flea market will be featured. There will be free overnight parking for self-contained campers on May 31. Talk-in on .25/.85 and .16/.76. For more information or for advance tickets, write to Amateur Fair, PO Box 857, Hopkins MN 55343; (612)-566-4000.

NH/VT NEIGHBORS DAY
JUN 1

Special-event station W1GUA will be operated from Fort Number 4 in Charlestown NH on June 1, 1985, from 10:00 am to 5:00 pm, to mark New Hampshire/Vermont Neighbors Day. The multi-operator station will be operating 25 kHz up from the bottom of the General portion of the 80-, 40-, and 15-meter CW and phone bands, as well as 2-meter simplex and packet radio. For a commemorative QSL, send a business-size SASE and QSL to Rudy Adler W1GUA, Dodge Hollow Road, Lempster NH 03605, or to WB1GXM, PO Box 428, Claremont NH 03743.

MIDLAND MI
JUN 1

The Central Michigan Amateur Repeater Association will sponsor the 11th annual Midland Hamfest on Saturday, June 1, 1985, from 8:00 am to 2:00 pm, at the Midland Civic Arena, Midland MI. Admission is $3.00 in advance and $4.00 at the door. Tables are $6.00 for a full table, $3.00 for a half table, and trunk sales are $3.00. Setup begins at 6:00 am. Free parking and handicapped parking will be available. VE license exams will be given. Refreshments will be available. Talk-in on 147.60/.00 and 146.52. For advance tickets or more information, contact Raleigh L. Wert W8QOI, 309 E. Gordonville Road, Route 12, Midland MI 48640; (517)-631-5591.

GRAND RAPIDS MI
JUN 1

The Independent Repeater Association of Grand Rapids will hold its annual Hamfestival on June 1, 1985, from 8:00 am to 4:00 pm, at the Wyoming National Guard Armory on 44th Street, west of US-131. Admission is $3.50. Programs include satellite operation, packet radio, a CW copying contest, a shack picture contest, entertainment films for non-hams, and more. There will be a 15,000-square-foot indoor swap area and table space is free for all sellers. Dealer setup begins at 6:00 am. Talk-in on .165/.765. For more information or for table reservations, call Paul Gardner WD8IZB at (616)-538-8241 or write to IRA, 562 92nd Street SE, Byron Center MI 49315.

OHIO WINE MONTH
JUN 1–2

The Wireless Institute of Northern Ohio (WINO) will commemorate Ohio Wine Month by operating special-event station KO8O on Saturday, June 1, 1985, from 7:00 pm to 11:00 pm, on 3860 and 7235 kHz, and on Sunday, June 2, 1985, from 11:00 am to 3:00 pm, on 7235 and 14,235 kHz. The station will be located at a winery in Madison OH. For an 8½ × 11 certificate, send a legal-size SASE to: KO8O—WINO Weekend, 7128 Andover Drive, Mentor OH 44060.

HARRY'S HEYDAYS
JUN 1–2

The Southside Amateur Radio Club will operate special-event station N0EWP on June 1–2, 1985 (Harry's Heydays), in honor of President Harry S. Truman's 101st birthday, from near the old Truman farm home in Grandview MO. The station will be on 7235 and 14235 (±QRM). The times of operation will be: June 1, 1700–2400 UTC; June 2, 0001–0400 UTC and 1700–2200 UTC. A commemorative certificate will be available for a 9 × 12 SASE and 33 cents postage. QSL to: Southside Amateur Radio Club, PO Box 412, Grandview MO 64030.

COLUMBUS OH
JUN 2

The Battelle ARC will sponsor the fifth annual Ohio Hamfest on Sunday, June 2, 1985, from 8:00 am to 3:00 pm, at the Ganyard building on the Franklin County Fairgrounds, Columbus OH. Admission is $2.00 in advance and $3.00 at the door. Tables are $3.00 in advance and $4.00 at the door. Talk-in on 146.37/.97. For advance sales, send an SASE to Bill Welch W8LLU, 396 Brevoort Rd., Columbus OH 43214. For more information, call Bill W8LLU at (614)-261-7053 or Kevin WA8OHI at (614)-766-5313.

PITTSBURGH PA
JUN 2

The 31st annual Breeze Shooters Hamfest will be held on Sunday, June 2, 1985, from 9:00 am to 5:00 pm, at the White Swan Amusement Park, PA Route 60 (Parkway West), near the Greater Pittsburgh International Airport. There will be a flea market and family amusement park. Sheltered tables are available by advance registration. Talk-in on 146.28/.88 or 29.000. For further information, contact John Colbert K3SDL, 1831 Highland Avenue, Irwin PA 15642; (412)-883-5167 evenings.

HUMBOLDT TN
JUN 2

The Humboldt Amateur Radio Club will sponsor its annual hamfest on June 2, 1985, from 8:00 am to 4:00 pm, at Bailey Park, 22nd Avenue, Humboldt TN. Admission is $2.00. Features include a flea market, food, parking for RVs (electricity provided, water close by), and alternate activities. Talk-in on .37/.97. For more information, contact Ed Holmes W4IGW, 501 N. 18th Avenue, Humboldt TN 38343.

CHELSEA MI
JUN 2

The Chelsea Swap and Shop will be held on Sunday, June 2, 1985, from 8:00 am to 2:00 pm, at the Chelsea Fairground, Chelsea MI. Admission is $2.50 in advance and $3.00 at the door. Children under 12 and non-ham spouses will be admitted free. Setup begins at 5:00 am. Talk-in on 146.520 simplex and 147.255 (Chelsea Repeater). For more information or advance tickets, contact William Altenberndt, 3132 Timberline, Jackson MI 49201.

PRINCETON IL
JUN 2

The Starved Rock Radio Club will sponsor a hamfest on June 2, 1985, in Princeton IL. Admission is $2.50 in advance (before May 20) and $3.00 at the door. VE exams will be given and no pre-registration is required. For exam details, send a long SASE to Denny R. Chestney KM9L, 1212 Dogwood, Bloomington IL 61701. For complete hamfest information, contact W9MKS, RFD #1, Box 171, Ogiesby IL 61348; (815)-667-4614.

TERRE HAUTE IN
JUN 2

The 39th annual Wabash Valley Amateur Radio Hamfest will be held on Sunday, June 2, 1985, beginning at 8:00 am, at the Vigo County Fairgrounds on US 41, ½ mile south of I-70, Terre Haute IN. Admission is $2.00 in advance (3 for $5.00) or $3.00 at the gate. Children under 12 are free. Covered flea-market spaces are $3.00 for a 12 by 12 space. The outdoor flea market is free. Some tables and ac power will be available on a first-come, first-served basis. Food will be served. Talk-in on .25/

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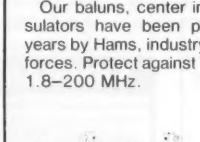

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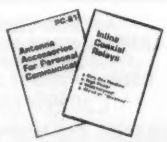

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.85 and .52 simplex. For tickets or more information, send an SASE to WVARA Hamfest, PO Box 81, Terre Haute IN 47808.

ROME NY
JUN 2

The Rome Radio Club will hold its 33rd annual Ham Family Day on Sunday, June 2, 1985, at Backs Grove, Rome NY. There will be something of interest for everyone: games, contests, the largest flea market in the area, good food, and educational and scientific presentations. The day will be climaxed with a fine dinner and the presentation of our "Ham of the Year Award." For further information, contact the Rome Radio Club, Inc., PO Box 721, Rome NY 13440.

MANASSAS VA
JUN 2

The Ole Virginia Hams ARC, Inc., will sponsor the eleventh annual Manassas Hamfest on Sunday, June 2, 1985, at the Prince William County Fairgrounds on Route 234, one-half mile south of Manassas VA. Admission is $4.00 per person (under 12 free). No advance sales. General admission is at 8:00 am, 7:00 am for tailgate setup. Activities include tailgating, indoor commercial exhibits, breakfast and lunch menus on grounds, YL program, and CW proficiency awards. Talk-in on 146.37/.97 (Manassas repeater WA4FPM) and 146.52 simplex. For further information, contact Art Whittum W1CRO, General Chairman, Manassas Hamfest, c/o Ole Virginia Hams ARC, Inc., PO Box 1255, Manassas VA 22110; (703)-361-4819.

NIAGARA FALLS NY
JUN 5–8

The Antique Radio Club of America (ARCA) will hold its annual international convention on June 5–8, 1985, in Niagara Falls NY. This year's convention is sponsored by the Niagara Frontier Wireless Association of Buffalo NY. Features of the convention will include speakers, tours of radio collections, and tours of the Niagara area. The highlight of the convention will be a large flea market where radio collectors will swap and sell parts, tubes, and associated literature. There will also be an auction of radios and associated items. The Niagara Falls area provides many recreational opportunities for family members whose interests do not include old radios. For information on the convention and on ARCA membership, write to NFWA, PO Box 68, Central Park Station, Buffalo NY 14215.

FORT KNOX KY
JUN 7–9

The Armored Force Amateur Radio Nationwide Emergency Team (A FAR NET) will hold an Eyeball Bivouac on June 7–9, 1985, at Fort Knox KY, the US Army's Armor Center. The gathering place will be the Best Western Gold Vault Inn in Radcliff (just outside the Fort). Campers can use the Fort Knox Campground facilities at Camp Carlson. For further information on the Eyeball Bivouac, contact Carl Quickmire WB4UBS, 6341 Cloverdale Drive, Columbia SC 29209. A FAR NET is a group of radio amateurs who at some period of their lives served in or were attached to an armored (tank) unit of the armed forces. Any amateur who has ever served with or been assigned to an armored unit of the US Armed Forces or its allies is eligible for membership. A family member holding an amateur license is eligible for an associate membership. For further information about A FAR NET or for membership information, send an SASE to Harry B. Thomsen W2PJH, 348 Jefferson Avenue, Apt. 15, Canandaigua NY 11424.

BOWLING GREEN KY
JUN 8

The Kentucky Colonels ARC will hold its annual hamfest on June 8, 1985, beginning at 8:00 am, at the Jaycee Pavilion (inside a/c) on the So. Kentucky Fairgrounds, off US 231 North, Bowling Green KY. Admission is $2.00 and tables are $2.00. Outside setup is free. Refreshments will be available. Talk-in on 146.85/.25. For more information, contact Ed Gann N4HID, 445 Elrod Road, Bowling Green KY 42101; (502)-843-6911.

COEUR D'ALENE ID
JUN 8

The Kootenai ARS will sponsor Hamfest 85 on Saturday, June 8, 1985, from 8:00 am to 4:00 pm, at the Kootenai County Fairgrounds, Coeur D'Alene ID. Admission and swap tables are free. Setup is at 7:30 am. Free parking and food are available. RVs are welcome. Exams will be given. Talk-in on 146.38/.98. For more information, contact Jim Monroe N7ESU, W. 2455 Hidden Valley Road, Rathdrum ID 83858; (208)-687-0136.

ICE HARBOR DAM
JUN 8

The Tri-City ARC will operate special-event station W7VPA on June 8, 1985, from 1700–2400 UTC, from the Ice Harbor Dam, the highest lift navigable locks in the US. W7VPA will operate on the low end of the 10–80-meter General phone bands. For a special QSL, send an SASE to W7VPA, PO Box 73, Richland WA 99352.

BSA 75TH
JUN 8–9

The Chicago Suburban Radio Association will operate special-event amateur-radio station N9BAT from Brookfield Zoo in celebration of the 75th anniversary of the Boy Scouts of America. The Zoo will be hosting Scout-O-Rama, sponsored by the West Suburban Council, with over 5000 Scouts participating on the beautiful 200 acres of the Zoo. Amateur-radio operation will be on June 8 and June 9, 1985, from 1500 UTC to 2300 UTC, using the phone frequencies of 7.250 MHz and 14.250 MHz. A special "Eagle" QSL card (see page 82) symbolizing the highest rank in Boy Scouts will be available to all stations that reply with their QSL card and a #10 business-size SASE to N9BAT Special Event, PO Box 88, Lyons IL 60534.

CATFISHPEDITION 85
JUN 8–9

The Manitoba DX Group will operate VE4CAT for Catfishpedition 85 on June 8 and June 9, 1985, in the northern part of Manitoba. Talk-in frequencies: phone 7.200 and 14.259 MHz; CW 7.100 and 14.075 MHz. Spcial-event QSL cards will be issued from the Manitoba DX Group, PO Box 28, Group 322, RR3, Winnipeg, Manitoba, Canada R3C 2E7.

ALEXANDRIA LA
JUN 8–9

The Central Louisiana ARC will sponsor a hamfest on June 8–9, 1985, at the Bolton Avenue Community Center, 315 Bolton Avenue, Alexandria LA. Admission is free and swap tables will be available. There will be VE exams. Talk-in on 147.93/.33 or 146.04/.64. For more information, write to CLARC, PO Box 7772, Alexandria LA 71306.

FT. OGLETHORPE GA
JUN 8–9

The John Ross Amateur Radio Club will hold its annual hamfest on June 8–9, 1985, at the Lakeview-Ft. Oglethorpe High School, Ft. Oglethorpe GA (on Highway 2A, Exit 141, 4 miles off of I-75). There will be indoor air-conditioned dealer spaces and indoor and outdoor flea-market spaces. Tables will be available. Free parking and food will be available. Talk-in on 145.35/down. For reservations or more information, contact JRARC, PO Box 853, Rossville GA 30741; (404)-861-5610.

WENATCHEE WA
JUN 8–9

The Apple City Amateur Radio Club will sponsor the Central Washington Hamfest on June 8th and 9th, 1985, at Rocky Reach Dam, 7 miles north of Wenatchee WA on Highway 97. Admission is $5.00 for amateurs, $1.00 for non-amateurs. Children under 12 are free. Free camping and trailer space with power will be provided at the park. Events will include equipment displays and a swap shop. A banquet will be held on Saturday at 6:30 pm at the Masonic Temple. Talk-in on 146.07/.67 or 146.49 simplex. For reservations or more information, contact Merton Hiatt KD7YR, 1002 North Surry Road, Wenatchee WA 98801.

GRANITE CITY IL
JUN 9

The Egyptian Radio Club will hold its annual hamfest on Sunday, June 9, 1985, from 8:00 am to 3:00 pm, at the Egyptian Radio Clubhouse and grounds, Granite City IL. (I-270 to Route 3 South, turn right at Chain of Rocks Road and follow the signs.) Tickets are $1.00 in advance, or $2.00 each or 3 tickets for $5.00 at the hamfest. Flea-market spaces available on a first-come, first-served basis with the first space free (approximately 10 feet). Additional spaces will be $5.00. There will be a food stand and plenty of cold soft drinks. Free parking and shaded rest area will be provided. Talk-in on 146.16/.76 or 146.52 simplex. For more information, please send an SASE to the Egyptian Radio Club, PO Box 562, Granite City IL 62040.

NEWINGTON CT
JUN 9

The Newington Amateur Radio League will hold a flea market on Sunday, June 9, 1985, from 9:00 am to 2:00 pm, at Newington High School, Willard Avenue, Route 173, Newington CT. Admission is $2.00, tables are $8.50 (after May 31, $10.00), and tailgating is $5.00 (WX permitting). Talk-in on 146.52 simplex or W1AW/R 145.45 and 224.840. For tables, contact Tim Namnoum KM1O, 55 Spruce Street, Newington CT 06111.

MELVILLE NY
JUN 9

The Long Island Mobile Amateur Radio Club (LIMARC) will sponsor the Long Island Hamfair on Sunday, June 9, 1985, from 9:00 am to 4:00 pm, at the Electricians Hall, 41 Pinelawn Road, Melville, Long Island NY. Admission is $3.00, $2.00 after 1:00 pm. A 4 × 6 table is available for

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MUNCIE IN
JUN 9

The Muncie Area ARC will hold its annual hamfest on Sunday, June 9, 1985, from 8:00 am to 3:00 pm, at the Delaware County Fairgrounds, Muncie IN. Admission is $2.00 in advance and $3.00 at the door. Tables are $5.00 each. Overnight camping will be available for $5.00 per space (includes water, electricity, and a dump station). Food and free parking will be available. For more information, tickets, or tables, contact Charles Stanly WB9BSE, 3609 N. New York, Muncie IN 47304; (317)-282-9738.

WINFIELD PA
JUN 9

The Milton Amateur Radio Club will hold its 14th annual hamfest on Sunday, June 9, 1985, from 8:00 am to 5:00 pm, rain or shine, at the Winfield Fire Hall grounds, on Route 15 (south of Lewisburg PA, 8 miles south of Exit 31 off of I-80), Winfield PA. Admission is $3.00, and spouses and children will be admitted free. Features include a flea market, an auction, and a contest. Talk-in on 146.37/.97 and 146.025/.625. For more information, contact Jerry Williamson WA3SXQ, 10 Old Farm Lane, Milton PA 17847; (717)-742-3027.

AKRON OH
JUN 9

The Goodyear ARC will hold its 18th annual hamfest on June 9, 1985, from 7:00 am to 5:00 pm, at the Wingfoot Lake Park, near US 224 and SR 43, five miles east of Akron OH. Family admission is $3.00 in advance and $4.00 at the gate. Flea-market spaces are $2.00 and dealer spaces are $5.00 (inside shelter). Talk-in on .04/.64 (WA8UXP). For tickets or information, send an SASE to Don Rodgers WA8SXJ, 161 S. Hawkins Avenue, Akron OH 44313, or call (216)-864-3665.

WILLOW SPRINGS IL
JUN 9

The Six Meter Club of Chicago will hold its 28th annual hamfest on Sunday, June 9, 1985, beginning at 6:00 am, at Santa Fe Park, 91st Street and Wolf Road, Willow Springs IL (southwest of downtown Chicago). Admission is $2.00 in advance and $3.00 at the gate. Table space in the pavilion is $20.00 per space. For table reservations, contact John Trepina K9QYT, 5015 W. 31st Place, Cicero IL 60650. There will be refreshments and plenty of parking. Talk-in on 146.52 (K9ONA) and 146.37/.97 (K9ONA/R). For advance tickets, contact Val Hellwig K9ZWV, 3420 South 60th Court, Cicero IL 60650.

TECHNIQUES IN HIGH-SPEED PHOTOGRAPHY AND VIDEOGRAPHY
JUN 10–14

The Massachusetts Institute of Technology will offer a summer course on "Techniques in High-Speed Photography and Videography," on June 10–14, 1985. This photoinstrumentation program of complimentary lectures and laboratory experiences, under the direction of C. E. Miller and Dr. Harold E. Edgerton, is for scientists, engineers, and photographers who must gather data on rapidly moving subjects or events for study, analysis, and troubleshooting. All students will receive hands-on experience for two days in the MIT Stroboscopic Light Lab, and the program allows each student to tailor his work to best fit his background and needs. Questions relating to program content should be addressed to C. E. Miller, 4-405 MIT, Cambridge MA 02139; (617)-253-4629. For registration information, contact the Director of the Summer Session, E19-356 MIT, Cambridge MA 02139; (617)-253-2101.

SPIVEY'S CORNER NC
JUN 15

The Cape Fear Amateur Radio Society will operate a special-event station on Saturday, June 15, 1985, from the 17th annual National Hollerin' Contest in Spivey's Corner NC. The station will be operating under the club call, WB4YZF, from 8:00 am till 5:00 pm EST, on or near 7235 kHz. For a special certificate, send QSL and QSO information and $1.00 to Hollerin' WA4LZD, PO Box 332, Dunn NC 28334.

DUNELLEN NJ
JUN 15

The Raritan Valley Radio Club will hold its 14th annual hamfest on Saturday, June 15, 1985, beginning at 8:30 am, at Columbia Park, Dunellen NJ. Sellers spots are $5.00; no tables are supplied. Lookers are $2.00 donation per person. Food and drink will be available at the refreshment stand. Talk-in on the club repeater, W2QW/R, 146.025/.625 and 146.52 simplex. Advance tickets may be purchased from any club member. Further information may be obtained from any club member or by calling Jack W2IWK at (201)-756-2546, or Ted WB2TKU at (201)-725-3481, from 10:00 am to 10:00 pm.

TWIN FALLS ID
JUN 15

The Magic Valley Chapter of the Idaho Society of Radio Amateurs will hold a swap meet on Saturday, June 15, 1985, from 9:00 am to 5:00 pm, indoors, at the Moose Lodge, 835 Falls Avenue, Twin Falls ID. Admission is free. Swap tables are $2.00. Exams will be given and ARRL representatives will be present. Talk-in on .16/.76. For further information, write to PO Box 294, Twin Falls ID 83303.

COBB ISLAND MD
JUN 15–16

The Bowie ARC of Maryland will operate N3GR/3 from Cobb Island MD, where Fessenden and Very sent and received intelligible speech by electromagnetic waves in December, 1900. Operation will start at 1400 UTC on June 15, 1985, and will end at 1400 UTC on June 16, 1985. Phone and CW operation will be in the General segments of 80 through 15, as propagation permits. CW: 30 kHz up from the bottom and the Novice portions. Continuous operation on 7.250 MHz. Certificate for SASE to confirm contact with N3GR/3 during this annual Bowie ARC expedition. For further information, contact Oliver B. Martin, Jr. WB3BVL, 3708 Irongate Lane, Bowie MD 20715.

ERLANGER KY
JUN 15–16

The Northern Kentucky Amateur Radio Club will sponsor Hamorama '85 on June 15th and 16th, 1985, beginning at 8:00 am both days, at Best Western Vegas Convention Center, I-75 to Exit 184B (Route 236), Erlanger KY (eight miles south of Cincinnati OH). Admission for both days is $5.00 per person, or the entire family for $8.00. Children under age 16 are free. Flea-market tables are $5.00 each for the entire weekend. The hamfest will be completely indoors, air conditioned, and free parking will be available. Major vendor setup is Friday evening, June 14th, after 8:00 pm. Flea-market setup is after 6:00 am both Saturday and Sunday. Food will be available. Talk-in on 147.86/.26 or 147.975/.375. For additional information, contact John A. Thernes WM4T, 60 Locust Avenue, Covington KY 41017; (513)-397-7425 days and (606)-331-0331 evenings.

SANTA MARIA CA
JUN 16

The Satellite Amateur Radio Club will hold its annual swapfest and Santa Maria-style barbecue at the Union Oil Picnic Grounds just south of Santa Maria CA, beginning at 9:00 am, on Father's Day, Sunday, June 16, 1985. Tickets for adults are $7.95, children 6–12 are $3.50, and children under 6 are free. Swap spaces (approximately 2′ × 6′) are each $3.50. A barbecue will be served at 1:00 pm. For further information, to order tickets, or to reserve a swap table, please write to Satellite Amateur Radio Club Swapfest, PO Box 1753, Santa Maria CA 93456.

CROWN POINT IN
JUN 16

The Lake County Amateur Radio Club will sponsor its 13th annual Father's Day Hamfest on Sunday, June 16, 1985, at the Lake County Fairgrounds Industrial Building, Crown Point IN, which is located just inside the east gate. General admission is $2.50, with no advance sales. Free parking and tables will be available. Set up at 6:00 am. Hours are from 8:00 am to 2:00 pm. Features include MARS, ARRL/ARES tables, and computer demonstrations. Refreshments will be available. Overnight accommodations are close by. Talk-in on the Lake County ARC repeater, 147.84/.24, or .52 simplex. For more information, write Gene Hunkins KC9LH, PO Box 1909, Gary IN 46409, or call (312)-821-3210 (days) or (219)-937-9652 (evenings).

GLENDIVE MT
JUN 16

The LYARS of eastern Montana will hold its annual Father's Day picnic on June 16, 1985, at the National Guard Armory at the fairgrounds in Glendive MT. Registration is at 8:00 am and a potluck will be held at 1:00 pm. Licensing exams are tentative, pending interest. Camping hookups are available. For more information, contact Dave Brueni KC7AA, 215 3rd St. H.P., Glendive MT 59330.

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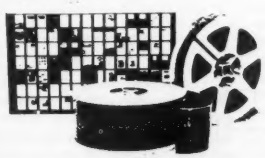

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FREDERICK MD
JUN 16

The Frederick Amateur Radio Club will hold its annual hamfest on June 16, 1985, from 8:00 am to 4:00 pm, at the Frederick Fairgrounds, Frederick MD. Admission is $3.00—YLs and children are free. Tables are $10.00 for the first one and $5.00 for each additional table. There is a $2.00 charge for tailgating. Setup begins at 8:00 pm on June 15, and overnight security will be provided. For more information, write Jim Kasunic KA3LPC, 9419 Highlander Ct., Walkersville MD 21793.

STEVENS POINT WI
JUN 16

The Central Wisconsin Radio Amateurs, Ltd., will hold its annual swapfest/family picnic on June 16, 1985, in Bukolt Park, Stephens Point WI. Features include dealers, food, and fellowship. Tables and tailgating areas will be available for $2.00. VE exams will be given. Talk-in on 146.07/.67 and .385/.985. For further information, contact Jim Benak KA9ACE, 1775 Strongs Avenue, Stevens Point WI 54481.

KLAMATH FALLS OR
JUN 20–22

The Northwest Division of the Mercury Amateur Radio Association will host the first annual MARA convention at Camp Easter Applegate, near Klamath Falls OR, on June 20–22, 1985. MARA will operate special-event station W7UFM from 2000 UTC, June 20, to 2400 UTC, June 22. Approximate frequencies will be 3.875, 7.275, 14.325, 21.425, and 28.525 MHz on SSB and 3.575, 7.115, 14.075, 21.115, and 28.115 MHz on CW. For a special commemorative QSL, send a large SASE to MARA, c/o Jack Jakoubek KD7EZ, 477 Deep Creek Road, Chehalis WA 98532.

YLRL CONVENTION
LAS VEGAS NV
JUN 20–23

The Young Ladies Relay League (YLRL) will hold its 10th international convention on June 20–23, 1985, at the Sahara Hotel, Las Vegas NV. Deluxe accommodations and RV parking are available for reasonable rates. Planned activities include a tour of Hoover Dam, a Lake Mead cruise, a desert tour, a stage show, a cocktail party, a luncheon buffet, an awards banquet, a DX YL show, slide shows, and business meetings. A convention station will be operating on 14,288 kHz and other frequencies. Registration forms can be found in the most recent issues of *Harmonics*, the YLRL's publication. For complete details and an information packet, send a business-size SASE (with 2 oz. of postage on it) to Jan Weaver N7YL, 2195 East Camero Avenue, Las Vegas NV 89123; (702)-361-3331.

NARF 25TH
JUN 22–29

The Nazarene Amateur Radio Fellowship (NARF) will operate special-event station WA6HPW/6 from June 22 to June 29, 1985, to commemorate NARF's 25th anniversary, during the General Assembly of the Church of the Nazarene in Anaheim CA. Frequencies will be 14.280, 14.305, and 21.385 during daylight hours. There will be some 40-meter activity. For a special QSL card, send an SASE to Robert Buck WB6UCO, 5162 W. Ave., L 12, Quartz Hill CA 93534.

YARMOUTH MA
JUN 23

The Yarmouth Repeater Association cordially invites you to their yearly Cape Cod amateur-radio and computer flea market and auction at the Mattacheese School, Yarmouth MA, on June 23, 1985. Gates are open from 9:00 am until 4:00 pm, with a giant auction from 1:00 pm to 3:00 pm. General admission is $1.00, with children under 12 free. Tailgaters are $2.00 per car and $8.00 per table. There will be excellent buys in used equipment, with plenty of refreshments, free parking, and good times. Talk-in on 147.645/.045. For more information, contact Bob Baker KQ1K, 2 High Grove Road, S. Yarmouth MA 02664.

KINGFIELD ME
JUN 27–30

The YL International Sideband System's annual convention will be held on June 27–30, 1985, at Sugarloaf/USA, located near Kingfield ME. Activities include the regular business meetings, a DX forum, a tour of the Rangeley Lake area, and a tour of Sugarloaf/USA with lunch at the top of the mountain. Accommodations at reasonable rates and RV parking are available. For complete details and a registration packet, please send a business-size SASE (37 cents) to Phyllis Davis KA1JC, PO Box 805, Presque Isle ME 04769.

MANCHESTER NH
JUN 29

The New Hampshire FM Association will sponsor New Hampshire's largest amateur-radio/electronic flea market on Saturday, June 29, 1985, beginning at 9:00 am, at the Manchester Municipal Airport. General admission is $1.00 per person; sellers are $5.00. Rain date is Sunday, June 30, 1985. Sellers should bring own table or tailgate. Commercial displays are welcome. Refreshments will be available. Talk-in on 146.52 FM. Send your pre-registration to 123 Woodlawn Circle, Portsmouth NH 03801. For further information, contact Doug Aiken K1WPM (603)-622-0831 or Pete Henriksen WA1RCF, 123 Woodlawn Circle, Portsmouth NH 03801; (603)-431-5432.

FORT LAURENS
JUN 29–30

The Tusco Amateur Radio Club (W8ZX) of Tuscarawas County OH will operate from 1400 UTC, June 29 until 2200 UTC, June 30, from Fort Laurens State Memorial near Bolivar OH, in conjunction with the Brigade of the American Revolution's reenactment of 18th-century military encampment, battle tactics, and field maneuvers. Ft. Laurens is the site of the only Revolutionary War fort built in Ohio. Operation will be on the lower 25 kHz of the General-class bands, 10 through 80 meters, SSB and CW, and Novice 7.130 and 21.150 ±10 kHz. Special commemorative confirmation will be issued. Send a legal-size SASE (3 IRCs for DX) and QSO information to William K. MacNealy WD8LFM, RR#1 D37, Bolivar OH 44612.

BRESSLER PA
JUL 4

The Harrisburg RAC will sponsor its annual Firecracker Hamfest on July 4, 1985, at the Bressler Fire Company picnic grounds, near Exit 1 of I-283 at Route 441; follow the signs to Bressler. Three motels and several restaurants are located at this exit. Admission is $3.00, with XYLs and kids free. There is no charge for tailgating. VE exams will be given. There is parking for 1000 cars. For more information or for table reservations, contact Dave KC3MG, 131 Livingston Street, Swatara PA 17113; (717)-939-4957.

FORT LARAMIE WY
JUL 4–5

The High Plains ARC will operate K7YPT from 0000 UTC on July 4, 1985, through 0000 UTC on July 5, 1985, at historic Fort Laramie. Frequencies will be: phone—3.850, 7.250, 14.300, 21.360, and 28.550; CW—50 kHz up from the lower band edge. For a QSL, send a business-size SASE to K7YPT, PO Box T, Torrington WY 82240.

RAPID CITY SD
JUL 5–7

The Black Hills ARC will celebrate its 50th anniversary by sponsoring the 1985 ARRL Dakota Division Convention on July 5–7, 1985, at Howard Johnson's, Exit 59 off I-90, Rapid City SD. Features include exhibits, a flea market (free tables), forums, and alternate activities for the whole family. Pre-registration and a Saturday-night banquet ticket is $18.00. Pre-registration is $6.50 (pre-registration deadline is June 10). Registration after June 10 is $7.50. Additional banquet tickets are $12.50. Sunday buffet tickets are $6.75 ($3.75 for children 12 and under). Talk-in on .16/.76 and .34/.94. For further information, tune in the SD Evening Net (3870) or call (605)-787-5243 or (605)-343-6791. For pre-registration (make checks payable to Black Hills ARC), write to Gene F. Bauer KX0U, 713 Blaine Avenue, Rapid City SD 57701. Indicate if you desire information on motels or campgrounds.

ATLANTIC GA
JUL 6–7

The Atlantic Radio Club, Inc., will sponsor the Atlantic Hamfestival/ARRL Convention in the Georgia State World Congress Center on July 6 and 7, 1985. Everything will be indoors this year, with much improved facilities and access. For further information, contact Bill Schmidt KF4CQ, Secretary and Hamfestival Chairman, 219 Devonwood Drive, Atlanta GA 30328.

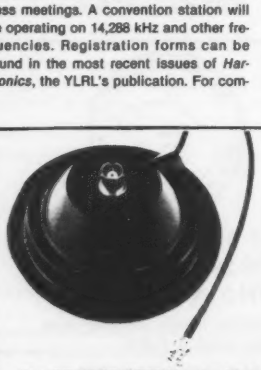
KINGSTON PA
JUL 7

The Murgas ARC (K3YTL) will sponsor the annual Wilkes-Barre Hamfest on Sunday, July 7, 1985, rain or shine, beginning at 8:00 am, at the 109th F. A. Armory, Market Street, Kingston PA (across the river from Wilkes-Barre). Admission is $3.00 and women and children under 16 are free. Tailgating spaces are $2.00 each. Tables and commercial power will be available. Setup begins at 6:00 am. Talk-in on 146.01/.61 and .52 simplex. For further information, contact the Hamfest Committee, PO Box 1094, Wilkes-Barre PA 18703; (717)-388-6863.

DOUGLAS WY
JUL 12–14

The Great Plains Repeater Association and the High Plains Amateur Radio Club will jointly sponsor the 1985 Wyoming Hamfest, to be held at the Wyoming State Fairgrounds in Douglas, Wyoming, on July 12–14, 1985. Items of interest include distributor displays, indoor flea market (tables available), license exams, seminars,

UP YOUR ERP



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DUTCHESS COUNTY NY
JUL 13

The Mount Beacon Hamfest will be held on July 13, 1985, from 8:00 am to 3:00 pm, at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County, NY. Admission is $2.00 and XYLs and kids are free. Tailgating spaces are $3.00 and tables are $4.00 (both include one free admission). The auction will take place at 2:00 pm. Free parking and food will be available. Talk-in on 146.37/.97 and 146.52. For more information, contact Julius Jones W2IHY, RR, Vanessa Lane, Staatsburg NY 12580; (914)-889-4933, or Steve Quigley KD2AK, Straub Drive, Pleasant Valley NY 12569; (914)-635-8539.

OAK CREEK WI
JUL 13

The South Milwaukee ARC will hold its annual swapfest on Saturday, July 13, 1985, from 7:00 am to 4:00 pm, at American Legion Post #434, 9327 South Shephard Avenue, Oak Creek WI. Admission is $3.00, which includes a "happy time" with free beverages. Parking, a picnic area, hot and cold sandwiches, and free overnight camping will be available. Talk-in on 146.94. For a map and more information, write to the South Milwaukee ARC, PO Box 102, South Milwaukee WI 53172-0102.

EAU CLAIRE WI
JUL 13

The Eau Claire Amateur Radio Club will hold its annual hamfest on Saturday, July 13, 1985, from 8:00 am to 4:00 pm, at the 4-H building in Eau Claire WI. Tickets are $2.00 in advance and $3.00 at door. Free tables and coffee will be available. Talk-in on .31/.91 and .52 simplex. For information or tickets, send an SASE to Gene Lieberg KA9DWH, 2840 Saturn Ave., Eau Claire WI 54703.

SHEBOYGAN WI
JUL 13

The Sheboygan County ARC will sponsor the sixth annual Lakeshore Swapfest and Brat Fry on July 13, 1985, from 10:00 am to 4:00 pm, at the Wilson Town Hall, south of Sheboygan WI. Admission is $2.50 in advance and $3.00 at the door. Children under 12 (with family) are free. Tables are free. Camping is available at Terry Andre State Park. Food will be served. Talk-in on .66/.06 and .52. For more information, contact KR9S, 6400 Hawthorn Road, Sheboygan WI 53081; (414)-457-3366 after 5:00 pm CDT.

MAPLE RIDGE BC
JUL 13-14

The Maple Ridge Amateur Radio Club will sponsor the Maple Ridge Hamfest on July 13 and 14, 1985, at St. Patrick's Center, 22589 121st Ave., Maple Ridge, BC. Admission for hams is $5.00, for non-hams $2.00. Food, swap and shop, commercial displays, bunny hunt, ladies' and children's programs will be available (close to shopping and swimming). Camper space (no hookups) will be available. Talk-in on 3.758 MHz, 146.20/.80, and 146.34/.94. For more information or pre-registration (20% off gate admission), contact Maple Ridge ARC, Box 292, Maple Ridge, BC, Canada V2X 7G2.

MARION COUNTY IN
JUL 13-14

The Indianapolis Hamfest will be held on July 13 and 14, 1985, at the Marion County Fairgrounds, at the intersection of Interstates 74 and 465, Marion County IN. The $5.00 admission charge entitles you to free parking. Flea-market setup on Saturday is at 8:00 am. Commercial vendor setup on Saturday is at 10:00 am. The hamfest runs to 5:00 pm on Saturday. On Sunday, gates open at 6:00 am and the commercial building opens at 8:00 am. There will be free camper facilities and hookups available on the grounds. There are motels close by. There will be technical forums, the ARRL State Convention, and a banquet. For more information, contact the Indianapolis Hamfest, PO Box 11776, Indianapolis IN 46201.

SUMMER EXTRAVAGANZA
JUL 13-14

The Parks and Recreation Department of the City of Waynesboro VA and the Valley Amateur Radio Association will operate special-event station KI4BR in Ridgeview Park, in celebration of Summer Extravaganza. Hours will be from 1700 UTC on Saturday and Sunday, July 13 and 14, 1985. A First Edition Certificate will acknowledge QSO and receipt of QSL. Send an SASE to KI4BR, PO Box 565, Waynesboro VA 22980 for further information.

BATTLE CREEK MI
JUL 13-21

The Southern Michigan Amateur Radio Society will operate W8DF/8 during the Seventh World Hot-Air Balloon Championship, July 13-21, 1985, in Battle Creek, Michigan, at W. K. Kellogg Regional Airport. Operation will be on phone in the center portions of General-class 80-10-meter bands, and CW in the Novice bands. For a special QSL, send an SASE to PO Box 934, Battle Creek MI 49016.

LAPORTE IN
JUL 14

The LaPorte and Michigan City ARCs will sponsor their summer hamfest on Sunday, July 14, 1985, from 8:00 am to 2:00 pm, at the LaPorte County Fairgrounds, on State Road 2, west of Laporte IN. Admission is $3.00. Indoor tables are available by reservation for $.40/ft. Food and parking will be available. For table reservations or for more information, write to PO Box 30, LaPorte IN 46350.

LOUISVILLE OH
JUL 14

The Tusco ARC (W8ZX) and the Canton ARC (W8AL) will sponsor the 11th annual Hall of Fame Hamfest on July 14, 1985, at the Nimishillen Grange, 6461, Easton Street, Louisville OH (just east of Canton on US Route 62). Registration is $2.50 in advance and $3.00 at the gate. Tables are for rent on reserved basis only. Parking is $2.00 per vehicle. The deadline for table reservations is July 1st. Features include good food, a large flea market, dealers, forums, and more. Talk-in on 146.52/.52 and 147.71/.12 (W8ZX). For more information or reservations, contact Butch Lebold WA8SHP, 10877 Hazelview Ave., Alliance OH 44601; (216)-821-8794.

WHEELING WV
JUL 21

The Triple States Radio Amateur Club will hold its 7th annual Wheeling WV Hamfest and Computer Fair on Sunday, July 21, 1985, from 9:00 am to 4:00 pm, at Wheeling Park, Wheeling WV. Admission is $3.00. Children under 12 are free. Dealers are welcome. Everything is under one roof, and tables will be available. There will be 5 acres of flea market, free parking, and refreshments. Talk-in on 146.31/.91 or 147.75/.15. For further information or a map, contact Jay Paulovicks KD8GL, RD 3 Box 238, Wheeling WV 26003; (304)-232-6796, or TSRAC, Box 240, RD 1, Adena OH 43901; (614)-546-3930.

MOSCOW BLOWOUT
JUL 27-28

The Wichita Amateur Radio Club is sponsoring a Moscow Blowout at Moscow KS on July 27 and 28, 1985. The callsign will be W0SOE. The frequencies will be 5 to 10 kHz from the bottom edge of the General phone bands. QSL will be via W0SOE. There will be a mini-DXpedition to give everyone a chance to work Moscow.

WEST FRIENDSHIP MD
JUL 28

The Baltimore Radio Amateur Television Society (BRATS) will sponsor the Maryland Hamfest and Computerfest on Sunday, July 28, 1985, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to I-70, West Friendship MD. The facilities are accessible to the handicapped. Admission is $4.00. Tables along a wall with access to ac power are $20.00 each, or 4 for $75.00. Tables in the center of the floor are $10.00 each, with special rates for booths of 12 or 16 tables. Tailgating is $3.00 per space. Dealer setup will begin at 2:00 pm on Saturday, July 27 (overnight security will be provided). Free VE examinations will be given and no advanced registration is required. Refreshments will be available. Talk-in on 146.16/.76, 147.63/.03, and 146.52. For further information or for table reservations, contact Mayer Zimmerman W3GXK, BRATS, PO Box 5915, Baltimore MD 21208.

WIA 75TH ANNIVERSARY

The Wireless Institute of Australia, the world's first radio society, will celebrate its 75th anniversary during 1985. The WIA 75 Award will be available during the period from March 1, 1985, to December 31, 1985. To qualify, amateurs (and SWLs) need to contact (log) 75 members of the WIA. A contact will be valid only if the WIA member's individual membership number is logged. No more than 30 WIA members may be logged in any one callsign area. Send a log extract of the 75 members contacted and $2.00 (Australian) to WIA 75 Award Manager, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria, Australia.

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of June are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

AMSAT-OSCAR 10 APOGEE PREDICTIONS
JUNE 1985

			WASH		KANSAS		CALIF	
ORBIT	DAY	TIME	AZ	EL	AZ	EL	AZ	EL
1809	1	0600	108	0				
1810	1	1700					242	15
1812	2	1700					235	16
1814	3	1600			248	5	226	24
1816	4	1500	253	1	240	14	215	32
1818	5	1500	248	3	234	15	208	31
1820	6	1400	240	12	225	24	194	36
1822	7	1300	232	20	213	31	178	38
1824	8	1300	225	21	206	30	172	35
1826	9	1200	214	28	192	34	157	33
1828	10	1100	201	34	177	36	143	29
1830	11	1100	194	32	171	33	139	24
1832	12	1000	179	35	156	31	128	18
1834	13	0900	164	34	143	28	118	11
1836	14	0800	150	32	131	22	109	4
1838	15	0800	145	27	128	17		
1840	16	0700	133	22	118	10		
1842	17	0600	123	15	109	2		
1844	18	0600	121	10				
1845	18	1700					251	2
1846	19	0500	112	2				
1847	19	1700					246	4
1849	20	1600					238	13
1851	21	1500			250	2	230	21
1853	22	1500			245	4	223	22
1855	23	1400	250	0	237	12	212	29
1857	24	1300	243	8	228	21	199	34
1859	25	1300	237	10	222	21	192	32
1861	26	1200	228	18	211	28	177	34
1863	27	1100	218	26	198	33	162	34
1865	28	1100	211	25	190	31	157	29
1867	29	1000	199	31	176	33	144	26
1869	30	0900	185	34	162	32	132	20

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

THE ENVELOPES, PLEASE

This year the Fun! Poll celebrates its fifth anniversary. Five years of opening envelopes, entering data into micros, tallying results, and reading comments. It's been a gas, to use the vernacular, and we hope to keep doing it for many years to come.

Response levels were up a bit this year. In 1984, 987 readers answered the poll. This year, 1023 of you mailed or electronically transmitted your responses to Fun! HQ. That's an encouraging sign, showing our hobby still has a lot of fight left in it. And a lot of Fun!, too, we hope.

Here's what you had to say:

ELEMENT 1
BACKGROUND

1) Sex:
A) Male—96%
B) Female—4%
As usual.

2) Age:
A) 15 or below—5%
B) 16–21—8%
C) 22–39—25%
D) 40–59—34%
E) 60 or above—28%
Pass out the Geritol.

3) License class:
A) Novice—10%
B) Technician—11%
C) General—27%
D) Advanced—40%
E) Extra—12%
The poll, over the years, shows a gradual flow of hams over to the higher license classes. A lack of newcomers to the hobby?

4) Number of years licensed:
A) 1 year or less—4%
B) 1–5 years—25%
C) 6–10 years—17%
D) 11–20 years—36%
E) 21 years and up—18%
Ditto.

5) Do you have a new (post-March '78) call?
A) Yes—58%
B) No—42%
The WAs, WBs, Ks, and Ws are swiftly fading into little more than a fond memory.

6) How many hours a week do you devote to amateur radio?
A) 0–1 hour—15%
B) 2–5 hours —34%
C) 6–10 hours—32%
D) 11–20 hours—15%
E) 21 hours or more—4%
About the same as last year.

7) Which HF band do you use most?
A) 80–75 meters—14%
B) 40 meters—26%
C) 20 meters—27%
D) 15 and/or 10 meters—22%
E) Don't operate HF—11%
Not much change here, either.

8) Which VHF/UHF band do you use most?
A) 6 meters—0%
B) 2 meters—75%
C) 220 MHz—8%
D) 420 MHz and/or up—4%
E) Don't operate VHF/UHF—13%
Nor here.

9) Which mode do you use most?
A) SSB—41%
B) CW—23%
C) FM—31%
D) RTTY—4%
E) Other—1%
Nor here.

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenses.)
A) 0–$250—41%
B) $251–$500—38%
C) $501–$1000—15%
D) $1001–$2500—4%
E) $2501 and up—2%
A bit better than last year, but still reminiscent of 1933.

ELEMENT 2
SOCIAL CHARACTERISTICS

11) On the whole, hams are:
A) too young—7%
B) too old—25%
C) just the right age—68%
Perhaps.

12) Do you wear a pocket-saver?
A) Yes—4%
B) No—96%
Another great ham tradition bites the dust! Don't blame me for all of those torn and dirty shirt pockets.

13) Politically, how would you define yourself?
A) Conservative—59%
B) Middle-of-the-road—39%
C) Liberal—2%
Mondale for ARRL President! Why not? His running mate was Mr. Fun!'s congresswoman.

14) Should we get rid of the ARRL?
A) Yes—48%
B) No—52%
A tie?

15) How old were you when you first became a ham?
A) 15 or below—10%
B) 16–21—57%
C) 22–39—21%
D) 40–59—8%
E) 60 or above—4%
No significant change from last year.

16) Should the FCC increase the speeds on amateur CW examinations?
A) Yes—19%
B) No—81%
Guess not.

17) Do you own a home computer?
A) Yes—61%
B) No—39%
Each year, more and more micro-equipped hams.

18) If you answered "yes" to question 17, which brand?
A) Apple—19%
B) IBM—8%
C) Radio Shack—28%
D) Commodore—36%
E) Other—9%
Many respondents noted more than one computer.

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
A) Yes—64%
B) No—36%
Obviously.

20) Do you think the volunteer exam system has increased cheating?
A) Yes—31%
B) No—69%
Last year, you were more pessimistic.

21) Do business interests deserve some of our virtually abandoned bands?
A) Yes—30%
B) No—70%
Shall we gift-wrap them?

22) Should ham licenses have a minimum age requirement?
A) Yes—47%
B) No—53%
A minimum IQ requirement?

23) Should ham licenses have a maximum age requirement?
A) Yes—11%
B) No—89%
Whatsamatter, you can't take a joke?

24) Should hams be subject to periodic retesting?
A) Yes—7%
B) No—93%
Over our dead ham bands!

ELEMENT 3
OPERATING HABITS

25) If the users were restricted to data communications only (no phone or CW operation), would you be in favor of a no-code 220-MHz Digital-class license?
A) Yes—54%
B) No—46%
When compared to last year's response, our attitude on this question is liberalizing.

26) Would you be in favor of a no-code 220-MHz Digital-class ticket if it permitted phone operation in addition to data transmission?
A) Yes—22%
B) No—78%
Here, too.

27) Have you ever used a personal computer in connection with your amateur-radio activities?
A) Yes—72%
B) No—28%
Up 2 percent from last year.

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
A) Yes—57%
B) No—43%
No significant change from last year.

29) What do you think of people who view pay television services with MDS converters and satellite dishes that are not approved by broadcasters?
A) They're skunks—33%
B) They're within their rights—67%
Happy viewing.

30) Should we get rid of, or reduce in size, the CW subbands?
A) Yes—69%
B) No—31%
Up 8 percent from last year. The tide may be turning.

31) Do you think DX nets have a place in ham radio?
A) Yes—30%
B) No—70%
We got some really nasty comments on this one.

32) Do you think nets in general have a place in ham radio?
A) Yes—65%
B) No—35%
But no DX nets?

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters—12%
B) 220 MHz—4%
C) 450 MHz—37%
D) An even higher band—17%
E) Shouldn't bother to operate—30%
Says a lot, doesn't it?

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it—3%
B) Ignore it—15%
C) Complain to the FCC or some other organization—60%
D) Listen—22%
E) Join it—0%
Tell it to the ARRL.

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes—62%
B) No—38%
We believe you.

36) If required, could you pass the FCC theory test for your license class.
A) Yes—67%
B) No—33%
Would you lie to us? Nah.

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes—4%
B) No—96%
Accidentally, maybe?

38) Are you fluent in any computer language?
A) Yes—35%
B) No—65%
Digitalk.

39) If you answered "yes" to question 38, which language?
A) Basic—81%
B) Pascal—9%
C) Assembler—4%
D) Machine—0%
E) Other—6%
Basic wins, hands down.

40) Do you feel yourself competent to write a short Basic program?
A) Yes—34%
B) No—66%
Good for you.

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes—70%
B) No—30%
Down a bit from last year.

42) Do you solder together your own coax connectors?
A) Yes—97%
B) No—3%
Thank goodness. All is not lost.

43) Is your antenna system mounted on your house or on a tower?
A) House—92%
B) Tower—8%
Or flat on the ground, like mine was after the last windstorm.

44) Have you ever designed your own antenna?
A) Yes—2%
B) No—98%
Not even a dipole?

45) What do you think of contesting?
A) Great—8%
B) Good—26%
C) Okay—13%
D) Don't like it—20%
E) Despise it—33%
No significant change here.

46) What do you think of DXing?
A) Great—30%
B) Good—29%
C) Okay—14%
D) Don't like it—13%
E) Despise it—14%
No change here, either.

47) What do you think of repeaters?
A) Great—41%
B) Good—9%
C) Okay—33%
D) Don't like them—15%

E) Despise them—2%

Nor here.

48) What do you think of traffic handling?

A) Great—6%
B) Good—30%
C) Okay—30%
D) Don't like it—8%
E) Despise it—26%

Nor here (yawn).

49) If you heard an emergency net in progress, would you immediately join in and offer your services?

A) Yes—59%
B) No—41%

I say, stay away until you're called for.

50) Have you ever secretly hoped for a minor disaster to strike your community just so you could demonstrate your radio skills?

A) Yes—18%
B) No—82%

Not even a little?

SELECTED COMMENTS

Although I'm an avid CW nut and homebrew artist, I think that—if we hope to keep our great hobby alive and well—we must admit (open the door) to our videogame generation with a no-code, restricted license! These younger hams (who hate code) aren't bad—just state-of-the-art!—**KE5DQ**

Good show! As a professional marketer, I believe in surveys. I also hope this helps direct the future of our hobby!—**K0GND**

My high school ham club has virtually died since 1978. Kids would rather stay after school to play games on computers than study for ham licenses.—**W9MP**

HAM HELP

Wanted: A "south-center" scale for the CD-44 Ham II rotor indicator. I will answer all responses.

B. J. Wenner VE6WN
Box 66,
Ralston, Alberta
Canada T0J 2N0

I would like to obtain a schematic and any other information about the National 190 communications receiver. I will pay all copying and postage costs.

Allen Bethel KA0FYN
209 Raindrop Lane
Hendersonville TN 37075

I need an instruction manual or a schematic diagram for an Eico model 717 electronic keyer. I will pay the cost of postage and duplicating.

Ed Cartotto W6ZZN
665 Avenida Loma Portal
Newbury Park CA 91320

I am looking for a schematic diagram and/or manual for the Hammarlund HX-Fifty.

Manuel Varela Cetina XE3EA
Apartado 132
Merida, Yuc.
Mexico

Help! I need manuals or information on a Navy OS/34-USM/32 scope, a Mite TT299B/UG teleprinter, and a Collins SSB book. Please write before sending material. Costs refunded.

M. Crestohl VE2FW
Box 642
Montreal, Quebec
Canada H3Z 2Y7

I need the instruction manual and tuning information for the 3-element monobander for 20 meters by TELREX. I bought it secondhand and all the manuals were lost. I will very gladly pay all costs involved (copying and postage charges), even air mail.

Michel Basquin H. CE3DPD
PO Box 9, STGO. 10, Las Condes
Santiago, Chile

I would like to borrow or buy a copy of the instruction manual for an Azden PCS-2800 transceiver. I will pay the cost of copying and postage.

John W. Sherman W6KAS
5301 Demaret #11
Bakersfield CA 93309

I need schematics for a National NC-270 receiver, a Hallicrafters SX-140 receiver, and an HT-40 transmitter. I will gladly pay all costs.

Gene Ray WD4GUA
Route 1, Box 64A
Milner GA 30257

I'm looking for a RTTY/CW interface for the Timex/Sinclair 2068 Color Computer, and any other ham-related software for this machine.

Scott Harvey
N. 5011 Idaho Rd.
Newman Lake WA 99025

I am in urgent need of a schematic circuit diagram or any other service information for an Intertec SuperBrain QD computer terminal. The manufacturer can no longer supply these items. Please advise of costs involved. Photocopies are OK, or I can copy and return the originals by insured mail.

William L. Hoy
514 Price Street
Charleston WV 25302

Help! I am in desperate need of the schematic, manual, or any information on a Browning model ON-5A oscillosynchroscope (oscilloscope). I will gladly bear any cost incurred.

Rick C. Wilson
604 S. Germantown Road
Chattanooga TN 37411

Please help me locate antenna relay number 62-913 for a 1965 Drake TR4. It's not available locally or through the factory.

John Shishkoff K5BCU
6932 Hemlock St.
Houston TX 77087

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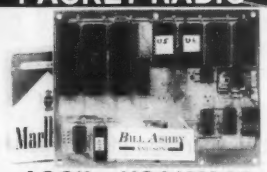
PACKET RADIO



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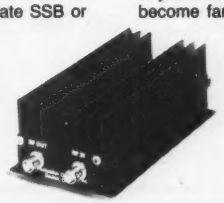

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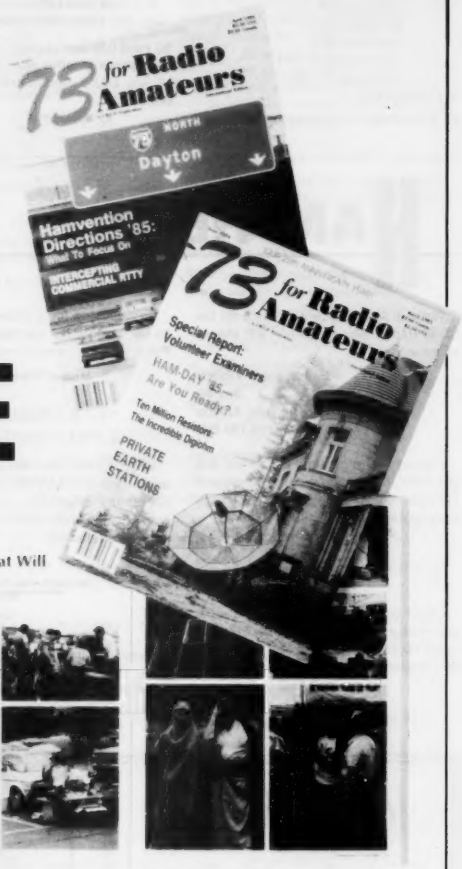
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NEW PRODUCTS

ICOM IC-735

ICOM announces the IC-735 ultra-compact all-ham-band HF transceiver and general-coverage receiver. Measuring only 3.7 inches high by 9.5 inches wide by 9 inches deep, the IC-735 is well suited for mobile, marine, or base-station operation.

The IC-735 features a large LCD readout and conveniently located controls which allow simple operation, even in a mobile environment. VOX controls, mike gain, and other seldom-changed controls are kept out of sight behind a hatch on the front panel of the radio, but are immediately accessible.

Standard features include: built-in FM operation, a 500-Hz CW filter, an electronic CW keyer, the HM-12 scanning microphone, 12 tunable memories with lithium memory backup, automatic SSB selection by hand, 12-V operation, continuously-adjustable output power (up to 100 Watts), and a 100% duty cycle.

A new line of accessories will also be available, including the AT-120 automatic programmable antenna tuner and the PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

For complete details, contact *ICOM America, Inc., 2380 116th Avenue NE, Bellevue WA 98004.*

SMARTWORK PC-BOARD DESIGN SOFTWARE FOR THE IBM PC/AT

Wintek's smARTWORK software, a low-cost tool for creating printed-circuit-board artwork, is now available in a version which runs on the IBM PC/AT. The program allows quick correction and revision of artwork, increasing design productivity and decreasing product-development time. Elementary functions are easy to learn, while advanced techniques allow sophisticated layouts.

Using smARTWORK, the designer can produce single-sided or double-sided printed circuit boards up to 10 by 16 inches. The layout can be displayed in either color or black and white. Prototype-quality 2X plots can be made on a dot-matrix printer, and production-quality artwork can be produced with a pen-and-ink plotter.

For complete information, contact *Wintek Corporation, 1801 South Street, Lafayette IN 47904; (317)-742-8428.*

HELP FOR DOS USERS

Help Technologies has announced HelpDOS, a help system for PC-DOS and MS-DOS. HelpDOS makes it easy to find out what DOS can do and how to use it. the menu-driven program provides on-screen reference information and examples for DOS commands, special keyboard keys, and batch subcommands. A technical dictionary explains the often confusing terms that one encounters with DOS and personal computers.

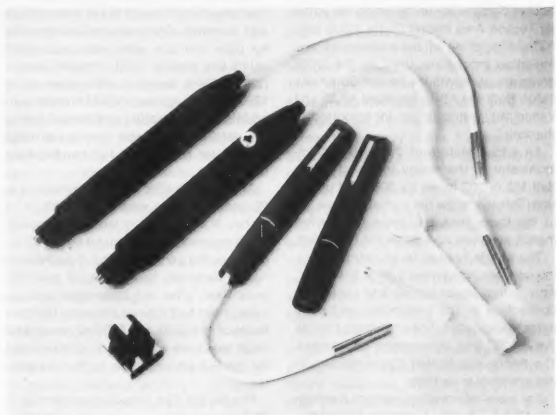
A unique "Hints" feature helps you find the right DOS facility for your task. For example, when you select the hint "Print," HelpDOS gives you a menu of the ways you can print using DOS. You can then select from this menu the help information that is most appropriate for your current need.

New help files and menus may be added to HelpDOS, allowing it to be used as a general "help tool." This provides a consistent way to organize and view on-line documentation for special programs, procedures, and batch files. Any text file stored in standard DOS (ASCII) format can be added to HelpDOS.

Available now, HelpDOS runs on the IBM PC, XT, AT, PCjr, and compatibles running PC-DOS or MS-DOS 2.0 or greater. Hardware requirements are at least one double-sided diskette drive and 128K RAM.

For additional information, contact *Help Technologies, PO Box 50834, Palo Alto CA 94303.*

The ICOM IC-735.



SMMI Products' Flexible Illuminator system.

FLEXIBLE ILLUMINATOR

SMMI Products has developed a new, high-intensity flexible lighting instrument. The special #1201 miniature lamp attached to the end of a nearly indestructible coaxial cable delivers a full 450-lumen brilliance to any area not accessible by normal lighting. The flexible characteristics of this special cable allow any configuration necessary to get the light where you need it.

The Flexible Illuminator™ has several adapters to help the technician. An illuminated pick-up magnet easily slips over the bulb to help locate and retrieve nuts and bolts. An extension handle to increase the pick-up length and a clip-on magnet to give hands-free lighting for hard-to-see areas are also available.

For complete information, contact *SMMI Products, 4231 112th Terrace North, Clearwater FL 33520.*

TC70-1 ATV TRANSCEIVER

P. C. Electronics has introduced a small 1-Watt 70-cm ATV transceiver. The TC70-1 accepts standard composite-video input from any source. Video- and audio-input RCA jacks on the rear panel are provided for connection to black-and-white or color cameras, computers, VCRs, etc. A front-panel switch selects video and audio input from these jacks or from the 10-pin connector which is provided for direct connection to many of the popular color cameras made for portable VCRs.

Full-color live-action video and sound is transmitted with over 1 Watt PEP on one

PC-board development software from Wintek.

ATV transceiver from P. C. Electronics.

Kantronics' new Packet Communicator.

Three swr meters by Welz.

of two selected crystal-controlled frequencies in the range 425 to 440 MHz. The line-of-sight snow-free radius with a TC70-1 and a KLM 440-27 antenna at each end is 15 miles. The unit is designed for portable use, but either a 20-Watt or 50-Watt video-compensated rf linear amplifier is available.

The receive downconverter uses a MRF966 dual-gate GaAsFET in both the rf preamp and mixer stages for high sensitivity and dynamic range. Front-panel tuning is variable over the whole 420–450-MHz band for receiving simplex and repeater ATV.

With the TC70-1, the only other items necessary to get on ATV is a good 70-cm antenna and low-loss coax, your TV set, and any device with a standard 1-V p-p composite-video output commonly found on black-and-white CCTV cameras, home-video color cameras and VCRs, computers, RTTY/video converters, etc. A Technician-class or higher amateur-radio license is required for operation and purchase from P. C. Electronics.

For more information and a complete catalog of ATV equipment, antennas, cameras, modules, and accessories, write or call *P. C. Electronics, 2522 Paxson Lane, Arcadia CA 91006;* (818)-447-4565.

KANTRONICS PACKET COMMUNICATOR

Kantronics has announced the Kantronics Packet Communicator, a new product for amateurs using computers in the shack.

With the ARRL adoption of the AX.25 protocol as the amateur standard, packet radio has become a viable form of data exchange. Thousands of amateurs have proven the new mode reliable using a hardware and software program devised by the Tucson Area Packet Radio (TAPR) group.

Kantronics has designed a new hardware format using an internal microprocessor to handle the protocol, and integrated circuits for signal processing. Data is transmitted between the Kantronics Packet Communicator and a computer using a serial RS-232 or TTL port. Baud rates of 300, 1200, and 9600 are supported. Any terminal or communications software program can be used to set up the computer to communicate with the Packet Communicator. The ability to exchange data with existing Packet Terminal Node Controllers has been achieved with the Packet Communicator by using the popular Tucson Area Packet Radio group software. Almost all of the commands and operation procedures used by the TAPR group are used with the Packet Communicator. Both the ARRL standard AX.25 and Vancouver protocols are incorporated in the unit.

An added feature of the Packet Communicator is the ability to select either Bell 103 or 202 tones for 300-baud operation. This will allow the operator to switch to the lower tone set, improving performance at slower speeds on the HF bands.

The unit is housed in an extruded aluminum case measuring 1.9″ × 5.9″ × 8″. An external power supply and cables for connection to the transceiver and computer are included. The user must provide the RS-232 and microphone connectors. The Kantronics Packet Communicator is not available in kit form.

For more information, contact *Kantronics, 1202 E. 23rd St., Lawrence KS 66046.*

CUSHCRAFT CATALOG

Cushcraft has released their latest full-line amateur antenna and accessory catalog. The 16-page, two-color booklet contains complete specifications on antennas in the frequency range from 3 to 450 MHz. There are three new Boomer 2-meter antennas, a two-element 40-meter beam, Cushcraft/Signals VHF mobile antennas, and a through-the-wall lightning arrester. To receive your free copy, write *Cushcraft Ham Catalog, PO Box 4680, Manchester NH 03108.*

NEW HAMTRONICS DIGITAL FSK DATA MODULES

With packet radio and other forms of digital data communications becoming so popular, Hamtronics®, Inc., has announced two new modules to complement their line of VHF and UHF FM transmitters and receivers. The new modules provide for data interface with radio equipment using the popular "202" modem format (1200/2200-Hz tones) at data rates up to 1200 baud on ordinary NBFM channels. In addition to modulating and demodulating the data pulses, these modules provide transmitter keying and full handshaking facilities.

The MO-202 FSK Data Modulator is a PC-board module measuring 1-7/8 × 4 inches. It automatically keys the transmitter in response to a "request to send" input from the computer, and it provides a "clear to send" handshake 25 milliseconds later, after the transmitter and receiver have had time to respond. Relative levels of the 1200- and 2200-Hz space and mark tones are equalized to compensate for the EIA pre-emphasis in the transmitter.

The DE-202 FSK Data Demodulator is a PC-board module measuring only 1-1/2 × 4 inches. It can be used with any FM receiver or transceiver to detect FSK transmissions and automatically provide a "receive carrier detect" handshake to the computer when mark or space tones are present. A special frequency-compensation circuit levels the two tones coming from the receiver to allow for maximum weak-signal response.

Other features of the two modules include 12-V-dc power-supply inputs, operation with either RS-232 or TTL computer interfaces, and built-in LED test indicators for each function. The MO-202 can switch B+ at up to 600 mA for transmitter keying. Full instructions are included to allow interfacing with any type of radio equipment.

For more information on these and other Hamtronics products, such as transmitters, receivers, repeaters, converters, and preamps, write to *Hamtronics, Inc., 65-F Moul Road, Hilton NY 14468-9535.*

VSWR BRIDGES

Welz Corporation and their American distributor, Encomm, Inc., have announced the introduction of a new series of wattmeters and vswr bridges. Some models meaure peak and average power, while the mobile units also measure the automobile's operating voltage.

For more information on the new line of wattmeters, contact *Encomm, Inc., 2000 Ave. G Suite 800, Plano TX 75074.*

TRIPLETT MODEL 4700 MULTIMETER

Penril's Triplett Electrical Instrument Corporation has introduced the new Model 4700 digital multimeter. The unit uses a microprocessor controller to provide features such as true rms metering, a logic probe, an audible continuity test, dBm display of voltages, and the capability to store an input signal with an offset value. Each function has automatic polarity switching, overrange indication, overload protection, and quantitized feedback A/D conversion. The meter uses a 4-1/2-digit high-contrast LCD, operates on 4 AA batteries, and has recessed jacks for maximum safety.

For complete details, write *Triplett Electrical Instrument Corporation, One Triplett Drive, Bluffton OH 45817.*

REVIEW

AEA PKT-1 PACKET RADIO CONTROLLER

Every once in a while something comes along in this amateur-radio hobby of ours that is just plain neat! I imagine some of you felt that way about single sideband. For me it was the OSCAR satellites. To varying degrees I've been excited about radioteletype, television, meteor scatter, QRP operation, and most recently, computers. What I've just discovered combines the technology of quite a few of those specialized techniques.

It's very difficult for me to separate my enthusiasm for a new mode of communications from the product itself. Fortunately, both deserve high marks, so there shouldn't be any conflict.

Just when you thought you finally understood RTTY, inexpensive computers came along. They made it possible for almost all of us to enjoy reliable, inexpensive, and (most importantly) quiet teletype communication. As a youngster at home I had to turn down more than one Model 15 because they just made too much noise.

Just to keep you on your toes, ASCII transmissions were introduced, and oh yes, let's get everyone stirred up about AMTOR as well.

A few years ago several small groups of amateurs began experimenting with yet another way to transmit digital data. Borrowing heavily from land-line-based systems, *packet radio* was born. The end result is a real revolution in amateur message communications.

Packet radio doesn't really use any hot-off-the-presses technology. It does allow maximum application of the existing technology.

73 carried an excellent series of articles about packet radio which began in Sep-

tember of 1983. I won't reinvent the wheel here, but suffice it to say that packet radio allows the use of relatively high speed ASCII transmissions with two important additions:

Addressing and identification information allow individual transmissions to be identified and routed to the final destination. Secondly, a mathematically-computed "checksum" ensures error-free reception of messages. These two enhancements make packet radio well suited to long-haul message delivery.

So what do you need to try out this new mode? First, you should know that most activity at present is on the 2-meter band. Many experiments are being done with HF linking and extremely high speed transmission rates on UHF, where bandwidth is not as much of a problem. If you own a 2-meter FM rig, you are part of the way there.

In order to properly receive and transmit packet, you need a terminal node controller, or TNC. That's where the PKT-1 comes in.

Finally, you need some kind of ASCII terminal. Mechanical machines, electronic "dumb" terminals, or a personal computer are all usable. If you are so inclined, you can even use the VAX system at work. That would look interesting on a QSL card!

The TNC is a computer in itself. Two microprocessors are included. One formats the packets, and the other one takes care of all the timing.

The PKT-1 is electrically a TAPR, Tucson Amateur Packet Radio, packet board. Under special license, AEA is manufacturing the packet controller fully assembled and tested and with a few additional bells and whistles thrown in to boot.

TAPR sells both bare boards and kits. The PKT-1 is aimed at the amateur who is not necessarily adept at working on microelectronics but still wants to join in.

As with all AEA products, the craftsmanship on the PKT-1 is superb. I always feel like I'm looking at something that has been built for the space program when I look at their boards.

Operationally, the PKT-1 is pretty straightforward. Included is a 100+-page instruction manual. If you want to learn even more, the technical manual is available for an additional charge.

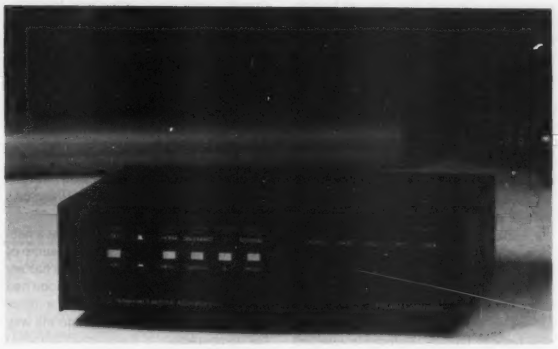
Setup is a breeze. Twelve-volt regulated dc is needed. That's one of the AEA enhancements. The PKT-1 is ready for mobile/portable packet operation, the TAPR board is not.

You'll need a connector to match either the microphone connector on your radio and the speaker jack, or one that matches your accessory plug on the rear of your radio.

Your terminal or computer must have a genuine RS-232 connection available. If you are a Commodore owner like myself, this will mean the construction or purchase of an interface to bring the Commodore TTL levels into line with the RS-232 standard. Incidentally, numerous official Commodore "VIC" RS-232 adapters have been closed out recently for $10.00 or so. The merchandisers don't seem to know that the adapter works just dandy on a C-64!

Once you are set with RS-232 levels, you'll need a cable with male DB-25 connectors on each end. Such cables are expensive when purchased ready-made. I built mine using wire from some scrap telephone multi-line cable. It took about an hour, but I saved about $25.00 and got the cable the length I wanted it.

Finally, if you are using a personal computer, you will need a terminal emulation program. The same program you use for regular modem communications will do quite nicely.



AEA's PKT-1 Packet Controller.

With everything connected, you are ready to go. The PKT-1 is very versatile and will adapt to almost any operating environment. When first trying the unit, you select the built-in ready-only memory. A set of default parameters is stored here. There is even an "auto speed" routine programmed that allows the PKT-1 to adjust to the terminal's speed. All you have to do is send a few "*" characters.

Once you are in communication with the PKT-1, you can adjust the terminal settings and other values to suit your station and needs. Something new to most of us, a nonvolatile random access memory (NOVRAM), allows you to store two sets of parameters of your own choosing. What makes the NOVRAM unique is that it requires no power backup.

Guess what? You get to learn a new set of commands! The program in the PKT-1 is so "soft" it will allow you all kinds of control over things. To access or check these items, you must input the proper mnemonic while in command mode. It's really not as hard as it sounds. BT, for example, is beacon text, B alone is beacon (timing), D means disconnect, C means connect, and so on.

Like any new language, it will take some time to learn. I assure you it will take a lot less time than learning any other computer language, though!

At this point, I was ready to fire away. Through some casual monitoring, I knew that local packet activity in my area took place on 147.555 MHz. In many areas of the country, however, activity is centered around 145 MHz, plus and minus a bit.

I also happened to know the callsigns for several of the packet stations in my area. Throwing caution to the wind, I typed: C WA9KRL. My radio sprang to life, lights flashed, a burst of packet sound came out of my speaker, and the screen flashed: ***Connected to WA9KRL***. So far, so good.

Unfortunately, that's about as far as I got until later in the day when everyone turned of their rigs and saw K9EI all over their screens.

Several options are available in the PKT-1 to allow for selective monitoring. You can choose to have all transmissions displayed, beacon messages only, or transmissions from a specific group of stations. Even with so much versatility available, it seems most stations in my area enjoy the "party line" aspects of monitoring all transmissions.

With some assistance, I learned of other stations active in my area and a wide-area packet repeater about 80 miles from me that provides coverage over a good portion of central Illinois. That's when things started getting interesting.

When connected to some stations, I found that both the receiving station and I were having difficulty receiving correct packets. With signals over S9, it didn't seem that the path was a contributing factor.

I noticed when monitoring my own signal on another radio that the first portion of my transmission seemed clipped off. Back to the manual and I discovered that I could set the amount of delay before I began actual transmissions. Problem number one had been solved.

The second problem was a bit more insidious. When connected to certain stations, or when repeating through these same stations, everything seemed to work well. Other stations, however, didn't seem to work well at all. I could repeat through one of the "good" stations, however, and everything was fine. I finally came to suspect my transmit tones.

I must explain that this particular PKT-1 has been jostled about a bit. It lived for a while at the famous W2NSD ham shack. After prying KW1O's fingers off of it long enough to get it in the mail, it was trucked across the country to me. It arrived while we were enjoying a balmy – 20-degree day here in central Illinois.

All of this allowed me to check out the diagnostic and adjustment part of the PKT-1 program. Talk about space-age. I was led step by step through the necessary adjustments to bring my tones right back on the money. All it took was a small screwdriver. A bobby pin probably would have worked in a pinch.

With the adjustment made and the clock reading 2:00 am, I keyed up a path to a packet MSO about 85 miles east of me. Pretty impressive, eh? Get this: My path was 50 miles northeast, 30 miles due north, and 110 miles south-southeast! I traveled almost twice the actual distance to get there with two relays. . .and it worked. . .error free.

To give another practical example, my folks live about 180 miles to the northeast of me. Using three or four relays (depending on band conditions), I can connect to a fellow just two miles from them. It sure beats the mail.

Nothing special is required to turn your PKT-1 into a digital repeater. In fact, unless you tell it otherwise, every TNC is also a digipeater. Your station simply stores the received data in memory and then retransmits it intact to the addressee.

Something that had escaped me in all of the literature about packet radio is that all kinds of special features can be implemented with very little trouble. I mentioned an MSO earlier. The PKT-1 doesn't care what kind of terminal program it is connected to, so you can easily adapt a bulletin-board program for use on packet.

Somewhat less ambitious, but along the same lines, are packet answering machines. They aren't bulletin boards or MSOs in the usual sense. All you can do is store a message (or a program for that matter) for the owner of the station.

There is even a "transparent" mode which allows files to be transferred without respect to their particular configuration. This is true binary transfer and makes sending computer programs from one machine to another quite easy.

With this in mind, all kinds of connections could be made. You are limited only by your imagination and FCC regulations.

The only fault I have found in the packet system involves disconnecting. On several occasions I have been connected to a remote station and experienced a band fade. No number of retrys would get the disconnect order through. If the station is unattended, this leaves that terminal "busy" until the owner manually disconnects it, or until the connecting station reestablishes contact and then disconnects. A simple watchdog timer could cure this problem. Keep in mind that the "hung-up" station is not transmitting or otherwise causing any problems. It is simply marked busy and is unavailable to other users.

There are some limitations in the built-in modem itself. The TAPR-designed unit comes equipped with an XR-2206 and XR-2211 chip set to generate and demodulate the FSK tones. The receive chip works well when the signal-to-noise ratio is relatively high. It starts to suffer problems as the ratio decreases.

Improvements to the operation of the chip are accomplished by filtering the input. The PKT-1 allows for the critical components in this filter to be mounted on a standard DIP header, so experimentation can be done easily. This also allows for operation at shifts other than 1000 Hz. I found that a bit of time spent in simply adjusting the audio level to the PKT-1 resulted in a quite noticeable improvement in reception. Others with TAPR-type boards report that level adjustment is also critical and varies widely depending on the radio used. Provisions are also available for using an external modem. In any case, the limitations are not peculiar to the PKT-1, but rather are inherent in the integrated circuit being used.

I told you I'd get carried away. The PKT-1 is superb. Packet radio is one of amateur radio's most promising frontiers. The combination of the two is terrific fun. Congratulations, AEA, for making the technology available in prepackaged form. Kudos to TAPR for all of their hard work in designing the board and bringing this new communications mode to the amateur community.

For more information about the PKT-1, contact *AEA, PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.*

Jim Grubbs
Springfield IL

KENWOOD TR-2600A

There's an old adage which says that "good things come in small packages," and in the hand-held transceiver market it is very true. Just look at what's available! There are rigs which fit in your shirt pocket, rigs which feature both sideband and FM operation, and compact rigs which have just about every feature you will find on a base or mobile transceiver.

Look at the Kenwood TR-2600A, for example. This microprocessor-controlled hand-held has some interesting features and capabilities. For instance, not only does this 1.2-pound rig transmit and receive through the entire two-meter range, but it also will transmit above and below to cover both MARS and CAP frequencies. It will transmit from 142 MHz to 148.995 MHz. Further, you can program this hand-held to cover the splits normally used by MARS or CAP and use any odd-split repeaters, using Memory 0.

All of this is pretty normal in today's hand-held rigs. The new Yaesu FT-209RH will do it, as will the ICOM-02AT. However, the TR-2600 has a couple of features which the others don't have. First, it will receive continuously from 140 MHz to 159.995 MHz with about the same sensitivity as it exhibits in the two-meter band. It won't transmit above and below the MARS or CAP areas, though.

And the Kenwood hand-held has DCS, or digital squelch, which works quite well. DCS is very much like selective-calling units which many amateurs have added to their base rigs. With the selective-calling circuitry, a receiver remains quiet until it hears a special code and then the squelch will open. DCS uses an ASCII burst "header" at the start of a transmission. Although it sounds like noise, what you are actually transmitting is a special code. If this code matches the code programmed into a second transceiver, the second transceiver will open and the receive circuitry will respond. If the second transceiver doesn't receive the special header, then it will remain quiet, as if nothing is going on. This system also allows you to program in your call so the second transceiver can see the station calling. It will appear on the Kenwood's LCD.

The TR-2600A is loaded with nice, user-oriented features. For example, all the major functions are programmable from the keypad, and the function switch which accesses them is also located on the pad. This means you can have direct access and implementation of such features as the offset, type of scan, type of scanning stop (tone or squelch), and memory. On some other hand-helds, you must hold down an awkwardly-placed function key to have access to these features.

Another nice feature is the ability to program in the offset, which is an improvement over the Kenwood TR-2500 (where you had to use a slide switch). The offset is retained in the memory of the TR-2600A, but you can easily change it with the function key and plus or minus keys. For nine of its ten memory channels, the TR-2600A assumes the standard 600-kHz offset.

Still another nice feature of this hand-held—and an improvement over the 2500—is the locking reverse switch. This allows you to check the input of a repeater to see if another station is within simplex range. On the 2500, the reverse switch didn't lock and you had to manually hold it for a long period of time.

When Kenwood upgraded its microprocessor-controlled hand-held from the 2500 to the 2600, they redesigned the unit. For instance, they moved the amp switch from the front panel to the right-hand side and the transmit-lock and keyboard-lock switches were moved to locations underneath the push-to-talk bar. Believe it or not, though, this makes these features more convenient for one-handed operation. The redesign also made room for a real, mini-sized S/rf meter, which also doubles as a battery condition indicator. It's a nice touch and enables you to check the received signal strength of any repeater or mobile station. It was placed on the top of this hand-held, evidently because Kenwood assumed most amateurs would be using this rig on their belts. Yaesu, on the other hand, has included its S/rf meter on the front panel, which does make it more convenient to use if the hand-held is laying on a car seat. Still, we can't quibble with either placement because either one has its advantages.

Like its predecessor, the TR-2500, the TR-2600A has low- and high-power settings. On low power, it puts out about 300 mW, while on high power it puts out about 2.5 Watts. These power levels are more than enough to work today's urban repeater systems, although they may not be high enough to work some repeaters in rural locations. For those repeaters, a small amplifier, using the TR-2600A as the exciter, should work quite nicely.

For those operators needing tone access, the TR-2600A is ready to accept a tone module, although you will have to order it as an option and install it. The tone switch is included on the top of the hand-held. This is unlike the 02AT, which has the tones built in. However, since most repeaters still are open access, the tone option remains just that, an option.

Looking at the specifications of the TR-2600A, you will find it is quite a capable unit. It only requires 8.4 V dc for operation, although it will accept 9 volts from manganese or alkaline batteries, which is a nice backup feature. Memory is retained with a lithium battery, which should be good for five years.

In operation, the TR-2600 uses about 35 mA with no input signal. It will pull as much as 800 mA in high-power transmit and as much as 400 mA with low power. Less than 1 uA is needed for the backup memory.

It is a double-conversion, superheterodyne unit. Its first I-f is the almost-standard 10.7 MHz and the second I-f is 455 kHz. It uses variable-reactance direct-shift modulation and its maximum frequency deviation is 5 kHz.

Our testing confirms that its published specifications are right on the money. Receive sensitivity is better than 1 uV for a signal-to-noise ratio of 30 dB and less than 0.2 uV for 12-dB Sinad. Selectivity is less than 24 kHz at 40 dB down and the passband width is more than 12 kHz at 6 dB down. Spurious response is better than 50 dB and squelch sensitivity is less than 0.25 uV. Audio output is more than 400 mW into an 8-Ohm load.

In operation, the 2600 is an excellent piece of equipment. It is easy to program and its scan modes are easy to implement. It also allows you to lock out memory channels during a scan. The priority feature is nice, especially if you like to monitor more than one frequency, because it quickly tells you if there is activity on the priority channel with a double beep.

The DCS is a nice feature, but it is more of a luxury than a necessity, unless your club or your friends plan a mass buy of these units. The reason is because there are few other Kenwoods out there with the DCS feature, and until they become widespread, there will be very little call for it. Still, it does work well, as tests with a neighboring station confirm. Not only does the squelch open when the second unit calls, but a small orange LED indicates you've had a call.

And speaking of LEDs, the Kenwood TR-2600 uses a multicolored LED to indicate both transmit and receive. It shows green for receive and red for transmit, which is another nice feature.

During testing through our local repeater and with other stations, we received praise for the audio quality of the rig and, at the same time, we can say that the receive audio quality is excellent. It is crisp and punchy. The signal-strength meter also is reasonably accurate.

We also found that on average a battery will last quite long while on receive, although continuous high-power transmission will quickly drain it. In fact, if you transmit at high power for as little as one minute in three, you will find the battery is worn down in about 1½ hours. Lower power should effectively double battery life. The normal battery is an 8.4-V-dc nicad. About the only quibble we found with this unit was its lack of a warning when the battery was about to fail. On the 2500, the transmit-receive LED came on and flashed and there was an audible warning beat, but on the 2600 the battery suddenly just fails, although I was able to get a handle on it after a time because the audio of the unit begins to fade just as the battery is about to go. Still, we wish Kenwood had used an audible warning. But it's a minor point and you quickly get used to the way the rig operates.

Interestingly, if you have a 2500 already, you will find many of the accessories are common to both, such as the MS-1 mobile stand. The speaker-mikes aren't, though, due to pin spacing differences.

The instruction manual, like all Kenwood manuals, is clear and accurate. It easily leads you through the various steps and modes of which this rig is capable. In fact, the rig has so many extra features that it would take far more space than we have here to describe them all.

Suffice it to say, though, that the microprocessor-controlled (CMOS CPU) TR-2600A is an excellent value. It is totally synthesized and offers many built-in features. If you opt for it, you won't go wrong. In fact, with the right accessories, you probably won't need a full-sized mobile rig again. It's that versatile a transceiver.

For more information, contact *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.*

Marc Stern N1BLH
Framingham MA

CAGEN CONTEST LOG

By actual count, in my ham shack alone, there are 4,936,233 logging programs for the Commodore 64 computer! Actually, I never was very good at large numbers, and I tend to exaggerate from time to time.

So why should you be interested in hearing about another logging program? Because this one, ladies and gentlemen, is a very fine program.

The very first thing that makes the CaGen program rise above many of the rest is that it is a true machine-language program, through and through. It's designed to handle up to 2500 contacts per file (disk). With that much information, rapid execution of the program is a must, and machine language is the only way to accomplish the needed speed.

Before going further, I must point out that the CaGen program is optimized for contest operation.

To get started, you first have to format a new disk to be used to store your contest files. Like many programs of this type, there are actually several programs included on the same disk. Simply loading "Contest" gives you a menu from which to make your choice.

With your newly-formatted disk in hand and the menu program loaded, you make your first selection. The file-building program creates relative files on your newly-formatted disk. This type of disk file allows for the quickest access to information. This process only needs to be done once for each contest.

From the moment the first menu appears, the CaGen program has a very professional look and feel about it.

Once the file is created, the computer does a "warm start," resets itself, and returns you to the standard C-64 power-up screen. This is true whenever one part of the program finishes. One of the few suggestions I have for improvement would be for the menu to be reloaded rather than for the machine to be reset. There may be programming considerations that don't allow this to happen easily, but it would be nice.

With this done, it's contest time. Selecting the contest log option from the menu, one simple question is asked. You must indicate whether the rules of the contest allow one contact per station per band. This determines how the dupe portion of the program will work.

Inputting the date and time comes next. For some reason (perhaps from VIC-20 training) programmers are in the habit of using the Commodore "TI" clock. It does not remain accurate during many operations. The C-64 has not one, but two honest-to-goodness real-time clocks built in. The CaGen programmers are among the first I have seen to take advantage of these clocks. Their time routines remain accurate regardless of what else is going on.

With a final input to indicate the band and mode, you are on your way. There is little worry of losing your log, since each entry is placed on the disk as you enter it. If you should take a power hit, the worst that happens is you may lose the current contact.

In a contest situation, time is important and the CaGen log requires only a minimum amount of information. You input the callsign and the report received. Everything else is taken care of, including serial numbers.

Changing bands or modes is made very simple. The dupe checking is quick and easy. You can search for a record by callsign or by record number. If you forget any of the commands, a simple "H" for help brings up an information screen.

It is possible to change an entry any time after it has been entered. That's the only point in the otherwise fine documentation where I got a bit confused. A bit of manipulation is necessary to make the update feature work as expected.

A unique feature of CaGen Contest Log is the QSO rate calculator. Whenever you wish, you can have your current QSO rate computed and displayed. The timing program even keeps track of your activity and assumes a break has been taken if you don't log an entry for 30 minutes.

In case you have three pairs of hands and an antenna farm that makes the Voice of America look like a neighborhood radio station, you can log more than 2500 contacts by creating several disks and dividing your log entries for different bands. Having a separate disk for each band is probably extreme overkill, but you could put 80 and 40 on one disk and the high frequencies on another for a total of 5000 records.

After the contest, the CaGen program totally eliminates the post-contest depression of creating the paperwork. Returning to the menu, you can print your log and dupe sheets. All you have to do is make sure the paper to the printer flows smoothly! The reports are nicely formatted and should satisfy even the most critical contest overseer.

I would give the CaGen Contest Log an

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73 Magazine*, Peterborough NH 03458.

"A" rating with no reservations. The inclusion of a disk utility option for formatting the blank disk would be appreciated by those of us who can never remember the disk commands. A return to the menu after leaving the various subprograms would make for somewhat smoother operation. Both of these features would be nice to have, but are far from necessary.

If you'd like more information, contact *CaGen Software, 4821 Rosecroft Street, Virginia Beach VA 23464.* Tell 'em good old Jim who has never made more than about 1200 contacts in any contest sent you. Of course, I didn't have a computer then, and propagation was lousy, and I ran QRP, and my neighbors shot down my antennas, and my dog was sick, and my T/R switch broke at the last minute and I had to use a knife switch to change from transmit to receive, and...

Jim Grubbs K9EI
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BE MY GUEST

Guest Editorial by Clay Freinwald K7CR

20-KHZ SPLIT

This month we present one side of the 20-kHz repeater spacing issue. In a question-and-answer approach, Clay Freinwald K7CR explores a few of the technical and emotional aspects of the problem. The discussion appeared in the Texas VHF FM Society's newsletter, and describes part of the process used in the Pacific Northwest to move to 20-kHz spacing. While originally written for repeater coordinators, we feel that the clear explanation of the thinking behind the 20-kHz issue is invaluable to the understanding of this controversial issue. We invite our readers to make their feelings known by writing to *73*, 80 Pine Street, Peterborough NH 03458.

Isn't the 20-kHz split a radical approach to the problem?

No, not at all. It may appear radical, but it's just a matter of perspective. Many hams feel that once a set of crystals is installed in a repeater, the system's frequency is cast in stone. This is simply not the case! A change of only 10 kHz is required. Who would not purchase two crystals in order to gain so very much? We made a serious mistake when we kept dividing splits by two—120-kHz spacing became 60, then 30, and now 15 kHz. Now that's radical! Looking back, we should have divided 60 kHz by 3 and saved a lot of people a lot of trouble. This would have been the rational move. And from an equipment-compatibility standpoint, 20-kHz spacing is not radical at all.

What about the cost of changing frequency?

In some cases the 10-kHz change has been accomplished by simply padding the existing crystals. Duplexers, cavities, antennas, and so forth do not have to be modified.

If my repeater changes frequency, what about the users that support the system?

It has been clearly shown all over the Pacific Northwest that users go wherever the repeater goes. At first, some owners were reluctant to change frequency for fear of losing those that had been on the repeater for years or, in particular, those who supported the financial aspects of the operation. Those fears, it turned out, were groundless...most people will look up the frequency in the repeater guide, dial it up, and operate.

Don't we want to wait until there is a national band plan before opting to change?

No! First of all, there is no such thing as a national band plan for two meters. We actually have seven different plans for the two segments. From 144.5 to 145.5 MHz we have three: 20-kHz spacing on odd-numbered frequencies (the most popular system), 20-kHz spacing on even-numbered frequencies (southern California), and 15-kHz spacing (Colorado). From 146 to 148 MHz there are four systems: 30-kHz spacing with no splinters, 30-kHz spacing with upright splinters, 30-kHz spacing with reverse splinters, and 20-kHz spacing.

The only "national" system we have is the 600-kHz offset, and in some congested areas this has been altered to squeeze in a few more repeaters at the expense of the simplex frequencies. We in the Northwest looked at all the plans and opted for the one that was the best for us—20-kHz spacing with a 600-kHz offset throughout the band.

Why were the odd-numbered repeaters asked to move?

Even though one additional pair would have been created had we gone to odd-numbered pairs, more repeaters would potentially have had to change frequency. Remember, the first repeaters were on the following pairs: .04/.64, .16/.76, .22/.82, .28/.88, and .34/.94—all even-numbered. Even today, as you drive through the small towns, you'll find that these are the pairs that are in use. In the Northwest we found that only 38 percent of our repeaters were on odd-numbered pairs. In New Mexico it is 44 percent. Simply put, going to the even pairs displaced the least number of repeaters.

Did all repeaters move down 10 kHz?

Generally, yes. This is to make it easier on the users with crystal-controlled radios. It is easier to pad a crystal down in frequency than move it up. In some cases the frequency coordinators asked that a system move up 10 kHz in order to permit better planning on a regional basis, or in cases where a downward move would result in intermod for existing or potential systems. This transition can be viewed as a chance to correct the coordination mistakes of the past. For example, if two machines were on .87/.27 and were interfering with each other, moving one system up and the other down makes good sense.

Can't we put more repeaters on the air using 15-kHz spacing?

The answer is yes...but at a price. The price paid is diminished quality. By going to 20-kHz spacing you will gain twelve new pairs in each metro area—pairs that can be reused over and over again following standard co-channel separation criteria. 15-kHz systems must be physically separated. This often requires that they be installed in areas that are undesirable, perhaps even away from populated areas.

All 15-kHz systems operate on a substandard modification of the original 30-kHz plan and actually degrade existing repeaters when they go on the air. With the 20-kHz plan there is no degradation to existing setups, and the newly-created channels are just as good as their neighbors. More repeaters for the sake of more repeaters should not be the goal of any amateur or amateur organization. With 20-kHz spacing there will be 59 viable, quality repeater pairs that should handle the communications needs of any area.

How long will it take for the change to 20-kHz spacing to be complete?

It will take about five years. In the metropolitan areas the pressure for spectrum is greater, so the time frame there is shorter. In rural areas where there is plenty of room, the change may take a long time. This is why, when you look through a repeater directory from the Northwest, you will still see systems on odd-numbered pairs. It is pointless to ask someone to change frequency when nothing will be gained. The five-year period is the same time frame that the ARRL is planning for changing from 15-kHz reverse splinters to upright splinters in some areas.

Has the ARRL recognized the 20-kHz plan?

Yes. In recent issues of the *Repeater Directory*, the League has noted that the Northwest is using 20-kHz spacing. They recognize that local options take precedence.

What does the Northeast part of the country say about all of this?

When asked for comments about the area changing to 20-kHz spacing, they responded that they are against it for one simple reason: They have an admittedly overcrowded band based on 15-kHz spacing, and they have no choice but to live with it. When you ask them what they would do if they had it to do all over again, they say that they would go with 20-kHz spacing. When the new repeater subband opened up, it was 20-kHz spacing that got the votes.

Can't we just leave well enough alone? Aren't there enough repeaters right now?

This sounds great. Unfortunately, there is no method of limiting the number of repeaters. They just keep coming, coordinated or not. A change to 20-kHz spacing would put physics on the side of the coordinators, creating a system where, when the band is full, it is still usable.

It is clear that to continue to fill the band with more and more repeaters is not a solution. A goal of quantity at the expense of quality has never created a better environment. Perhaps this is why the Pacific Northwest was the area to reject the "But we can put up more repeaters with 15-kHz spacing" argument.

Northwesterners are used to clean air and lack of congestion. We are pioneers at heart and don't always follow what has been done in New York or Los Angeles. We didn't on two meters, and as a result, threw out the old 30/15 system in favor of 20-kHz spacing, preferring quality to quantity. The coordinators of the Northwest have rejected the crowded concepts of the Northeast and Southeast as not requested, not required, and certainly not in the best interest of amateur radio.

Clay Freinwald K7CR is a member of the ARRL VHF Repeater Advisory Committee and is frequency coordinator for western Washington.

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RTTY LOOP

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Happy birthday to us, happy birthday to us... Why the festivities? Well because this column is eight years old this month! I've been having a ball writing for all these years, and I hope you have enjoyed reading as well.

If there has been one overriding theme within this column for the past several years, it has been how technology has radically changed the face of this hobby. Just looking at this column alone, when I started, I wrote each column out in longhand on a yellow pad, edited it, typed out a rough draft on an old manual typewriter, then typed a final draft (or two) for submission. After a while, I started using an electric typewriter, which did wonders for my weary fingers. About five and a half years ago, I started using my 6800 microcomputer as a word processor for the column, starting out with a borrowed dot-matrix printer and progressing to a Selectric. The latest change was to the CoCo, with another type of word processor. After talking to the crew in Peterborough, the next step should be to send the column to them electronically, rather than through the mail—including drawings! Yes, the times certainly are changing.

I know that many of you have come in since then, so maybe a look back would be interesting. My first column, in the June, 1977, issue of *73*, was highlighted by a picture of a Teletype® Model 15 teleprinter and contained a glossary of basic RTTY terms. By the way, an updated version of that column is included in the "RTTY Loop" reprint series. Wayne's editorial that month, under the "Never Say Die" banner, reviewed the then-current state of frequency allotments, fated to change some years later, and also devoted quite a bit of space to the arrival of the microcomputer. Wayne was looking then, as I know he and the rest of the crew still are, for good articles on all the facets of computers in amateur radio. Well, I guess some things never change.

There was one article on RTTY, a design by H. P. Fischer VE3GSP which stored 128 RTTY characters in a 2102 1K static RAM chip. Other articles of related interest included one on programming 82S23 PROMs, the Schottky version of the 8223 fusable-link-type PROM, by R. M. Stevenson WB2CZL, Clay Abrams K6AEP writing about SSTV and the 6800, and an antenna aiming program by Dennis Bodson W4PWF in both Basic and FORTRAN!

The ads? Well, while there were no products specifically directed at the RTTYer, they are quite a trip. From the "barrel of unmarked ICs for $4.00 (we can't test 'em!)" to good old Ampl'Anny, they are a trip in themselves. Oh well, let's bounce back to the present and see what wonders we have in store.

Over the past few months I have mentioned some of the products available in the PBJ CoCo line. This month, let me tell you about the one that causes quite a bit of notice when a visitor stops in the shack, and the one that makes the CoCo much more than a toy. Called "Wordpak," this plain ROMpack-style box plugs into the ROM port or expansion bus and feeds any standard monitor. Its output is an 80-column, 24-line video display with full upper- and lowercase display. Let me tell you, it looks as good on the screen as *any* computer, blue boxes included, and will make your friends sit up and take notice. As if that weren't enough, the engineers have packed enough features into the two versions of Wordpak to satisfy anybody. Cursor positioning, type of cursor, inverse video, and a powerful screen editor are all standard. Additionally, other features such as smooth scrolling, a software-controlled video switch, and a driver in ROM are available, depending on the version chosen. Interested? Drop Al Alberto of PBJ a note at PO Box 813, North Bergen NJ 07047. Be sure to tell him you want the information on Wordpak, as described in this month's "RTTY Loop," OK?

Over the past six months, I have been asking for input as to which programs for the various popular microcomputers you all are using, what you think of them, and other such comments. To date, I have asked about TI-99/4A, Apple II(x), Commodore, TRS-80 Z-80, and TRS-80 CoCo computers. Now, if you are using one of these and have not sent me a note, it's not too late, go ahead and do it now. But this month I would like to hear from the IBM and IBM-clone crowd—all those running the various MS-DOS and PC-DOS machines out there. From previous correspondence I believe that this is sparse territory, so I implore you to write if you are using any kind of RTTY software. I really do want to hear—good or bad.

The author in his natural habitat.

I am sending some of your complaints to the various publishers of the software involved and will ask that their comments be included when the material is published. Hopefully, I should start listing out some of this information within the next few months. Stay tuned!

As my telephone bill continues to mount, I again would like to note that if you would like, feel free to send me comments, questions, or whatever either by mail, that is, United States Postal Service, or via CompuServe. Send mail to the address at the top of this column, and include a self-addressed, stamped envelope if you would like a reply; send CompuServe E-mail to me at user number 75036,2501. I have also been known to hang around the CoCo SIG and occasionally the OS9 SIG. I don't do much browsing—that really does run up the bill!

Oh! The mailbag! Almost forgot all about it. Greetings to Bill Wells WA7YMG. Bill is looking to enter the RTTY world with his Apple computer. Hopefully, we will have some information in these pages about the Apple-compatible software, Bill. Thanks for the interest.

Here's a note from Morris Holliday, who is waiting for his Novice ticket in Gloucester Point, Virginia. Morris is looking to set his Radio Shack PCII up on CW and is looking for a receive program, as well as interface information. Well, Morris, I do not have any information on a receive program, but as a receiving interface, I should think that the PLL design shown here last month should do nicely. Let me know how things come out, and I will forward any information received on this to you.

Regards to David Burkhart N4CPT of Fort Lauderdale, Florida, who is another CoCo user who hopes to be on the air soon. David is interested in RTTY mailboxes, and I am sending him the list printed here a few months back. I would also like to take this opportunity to remind operators of such boards to drop me a note about your operations, so that I can note it here in the column and update the list.

Finally, here is a note from Richard H. Feltner W4ZTC of Safety Harbor, Florida, who writes that with his new Teletype Model 33 he has acquired a Bell-type 101 modem and wonders about the modem's use on the ham bands. Well, Richard, the Bell 101 standards are the commonly used "300-baud" frequencies used for telephone communications with bulletin boards, information services, mainframes, etc. They are not the same as the amateur AFSK frequencies. I don't think that it is practical to modify the modem to send and receive the amatuer frequencies. If you watch this column for the next few months, I think you will see a simple AFSK circuit that will do you fine for ham frequencies. As to the modem: If it works, put it on-line and look for some of the BBSs in your area, or even try some of the national information services.

Well, for those who have asked, and you know who you are, here is a picture of yours truly, sitting at the computer typing away. You see, I really do exist! So that's it for this month, let me hear from you either by mail or wire—I try not to get into the column on the air—and see if you can influence next month's "RTTY Loop."

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

FATHER MARSHALL MORAN 9N1MM

Have you worked Nepal 9N1? If you have, the odds are excellent that you worked Father Moran 9N1MM, Nepal's first and only amateur-radio operator. He has practically single-handedly knocked Nepal off the Most Wanted Countries list, while running a missionary school for several hundred young boys. And since Father's Day falls in June, it seems only fitting to honor this father of amateur radio in Nepal, a man who is also the spiritual and academic father to many thousands of young Nepalese.

Father Moran's amateur-radio career spans more than 65 years. He first became interested in radio in 1918, at age 12, when he visited a high school friend whose room was "Heaven for electric and electronics junk," Father Moran remembers. He and his buddy built crystal radios and 5–10-Watt spark transmitters from information in a radio handbook. As with many other radio pioneers, Marshall Moran (as he was then known) and his friend never concerned themselves with licenses!

Then the budding ham moved with his family to Chicago. As with many an amateur moving into a new city, Marshall located the largest antenna in the region and promptly knocked on the door underneath. Inside, a medical student/ham was soldering up an Armstrong superregenerative receiver. There were no ready-made store-bought radios in those days. Fascinated by the three-tube receiver, Marshall carefully copied down all the parts and the simple schematic. A trip to downtown Chicago and $90 later, Marshall was soldering up his first real radio. The young amateur had no trouble making the home-brew receiver work perfectly, and soon KYW, the local Chicago broadcast station, was coming in clearly. Marshall began building radios for family friends at $10 over the cost of the parts. With some of the profits from his electronic assembly business, Marshall read every issue of *QST* and other radio magazines. But he never applied for an amateur-radio license.

Father Moran's radio interests took a back seat to more pressing obligations for a few years, as at the age of 18 he joined the Jesuit Seminary in St. Louis, Missouri. There he studied languages and earned his master's degree and doctorate. After graduation, Father Moran headed for India, where he taught school and provided needed medical care for more than 20 years. And it was there in India that Father Moran's interest in radio resurfaced.

Father Moran was fascinated by the US aircraft in India during World War II, especially their radio communications sets: Hallicrafters SX28s. At the conclusion of the war, he went to purchase some supplies for his expanding school. The shopping list of war surplus equipment included a jeep, 400 beds, and a Hallicrafters SX28!

Father Moran was soon experimenting with various antennas and finally heard W4DPI in Tennessee. "I was in awe!" he remembers. The radio bug bit hard, and

Father Moran continued to try different antennas. Before long he obtained a transmitter and his first amateur-radio license.

Then, in 1961, Father Moran moved to Nepal, a part of the world which dearly needed the kind of school he was operating in India. He located an ideal site for his school: a mountain retreat once used by the Prime Minister of Nepal, but unoccupied at the time. Located in the town of Godawari, near the city of Kathmandu, and nestled at the foot of 9000' Himalayan mountains, the St. Xavier School for Boys has seen more than 20,000 students pass through its doors. 125 kinds of roses dot the property, which boasts a swimming pool, gymnasium, dining room, library, and dormitories for the 260 boys living at the school. Seven Jesuit friars and brothers staff the school, with help from about 30 local inhabitants. In addition to leading the students' education, Father Moran also looks after the students' physical health. Although he never completed his medical training, Father Moran treats many of the minor injuries and even serious diseases of his students. Dysentery, typhoid, and even leprosy are among the ills he has treated. And of course, Father Moran looks after the spiritual growth and well-being of his charges as well.

Getting On The Air In Nepal

When he first arrived in Nepal, Father Moran did not push the issue of amateur radio. "They had no idea what amateur radio was," he explains, "and I didn't want the government to think I was some kind of agent, so I didn't do anything" about getting on the air.

Then, in 1960, a small group of American engineers arrived in Nepal to set up a telephone and telecommunications system for the government. As part of the contract to do the work, each engineer (all hams, obviously) requested an amateur-radio license and callsign. Father Moran had no trouble convincing the engineers to add his name to the list of licensees. So Sam Maso, Tom Bell, Fred Vocal, and Father Marshall Moran were soon sporting new callsigns: 9N1SM, -TB, -FV, and 9N1MM. Father Moran was clearly eager to get back on the amateur bands; he got license #1!

To get on the air, Father Moran began to assemble a Heathkit® Cheyenne transceiver. There was no one in Nepal to whom he could turn for assistance. Father Moran probably knew more about electronics and radio than anyone else in the country at the time, aside from the visiting engineers—and none of them had ever assembled such a radio. "I took it very slowly and carefully," he says, "green wire to L1 (S2)." Soon Father Moran and the engineers were on the air, with a local net on 10, 15, or 20 meters AM.

When the engineers had completed their job, and the contract expired, Father Moran convinced the Nepalese government to continue amateur radio, and in particular to continue license #1, 9N1MM, by demonstrating the utility of the service, especially the lower bands, for communications throughout Nepal. The government indeed saw the advantages of radio communications and has continued to renew Father Moran's license every year since. However, this government interest has cost Father Moran the use of the 80-meter band. Hundreds of government stations now use the band, rendering it unusable for amateur radio.

He hasn't done too badly on the other bands, however. Father Moran worked his first 100 countries within weeks of getting a single-sideband rig. Over the past 25 years that he has been licensed in Nepal, he has made more than 250,000 contacts, and he and his QSL manager N7EB have sent out more than 80,000 9N1MM QSL cards. Once in the Top Ten Most Wanted list of amateur-radio countries, Nepal no longer ranks in the top 73, thanks almost entirely to Father Moran.

He is also one of the original members of the Southeast Asia Net, SEANET. Amateurs from Singapore, Hong Kong, Australia, New Zealand, and Thailand began meeting at 1200Z. This is 5:00 pm local time for Father Moran, an ideal time to be on the air from Nepal. After working hours, but before the bands opened up to Europe and the States, Father Moran ran SEANET. In addition to calling the net for many years, he has frequently attended the annual SEANET conventions scattered throughout Southeast Asia. In fact, he was asked to preside over the first SEANET convention, in Bangkok. His convention travel and his extended trip through the United States in 1984 are financed solely by contributions from other amateurs.

Father Moran's station is supported in the same manner—by the generosity of fellow hams. When some stateside hams mentioned that 9N1MM sounded weaker than usual, Father Moran explained that in order to rotate his antenna, he had to climb up and turn it with a wrench. A new rotor and control box arrived in Nepal soon thereafter. And when his well-used, 18-year-old Drake TR4 finally gave up the ghost, the R. L. Drake Company donated a new TR7 to the 9N1MM shack. Another time the Arabian Knights Net chipped in and sent a TH6 tribander to Nepal.

Besides operating, Father Moran's favorite amateur-radio activity is experimenting with antennas. He spent his last Christmas holiday in Nepal erecting a wire log-periodic antenna, aimed over the North Pole. "It's a good compromise between Europe and the States," he explains.

Father Moran operates almost every day of the year. Each morning, after the boys complete their morning calisthenics and Father Moran holds morning sick call, he tunes up on 20 meters, around 14215–35 kHz. Early morning local time turns into 0030-0200 UTC. Father Moran is frequently on the air in the evenings as well, beginning about 1200 UTC with SEANET and often after dinner, too. He prefers rag-chews to contest-style contacts and can even be worked on a list (see box).

Father Moran is not a "card collector," as he terms an avid DXer. He explains why: "I think it is more important for me to give people reports than for me to work a 'new one.' I don't even know how many countries I have worked. Probably about 300. But if you go for new countries too much, you ignore dozens and dozens of good fellows who would never work Nepal. Someone with a call like mine should spread it around as much as he can." DXers the world over are fortunate that Nepal's only amateur has this attitude!

When the 9N1MM callsign shows up in a radio contest, chances are that a visiting amateur is at the key or mike. Contests are definitely *not* Father Moran's favorite radio activity. As for a serious contest operation from Nepal, he confesses, "I fall asleep." And when it comes to getting on during a contest and giving out some multipliers, "I need a secretary or a computer. I keep calling the same stations over again."

Fortunately for contesters, almost every week another visitor drops by the St. Xavier School. Many of the visitors are hams, and many guest-operate the only amateur-radio station in the country.

Among the many noteworthy visitors to 9N1MM's small shack was Juan Carlos, King of Spain. The King was fascinated by the radio gear, and soon after his return to Madrid, the King was on the air as EA9JC, with a complete Drake line, just like his friend Father Moran. An autographed photograph of the King with his gear graces the 9N1MM shack. In another brush with royalty, Father Moran recalls his first contact with JY1: "He was my first Jordan contact, and I asked where to send my QSL." "To the Palace," came the reply, from King Hussein JY1!

One recent ham visitor was very active from 9N1MM. Tom Dugec YU2DX was a member of the Manaslu-83 Yugoslavian mountaineering expedition to Nepal. Tom spent a month operating 9N1MM as Father Moran's guest, while maintaining radio contact with the mountaineers. Tom amassed 13,100 contacts before the expedition was called off, after two climbers were killed in an avalanche. He describes some of his feelings about the visit:

"After a short period I became part of the school. Youngsters passed by, greeting me with a smile and 'Good morning, Father Tom.' Never in my life have I felt so good and warm inside. Father Moran is one of the most exceptional people that I have had the privilege to know, He is 76 (now 78) years young and has devoted his entire life to missionary work in India and Nepal. I can only say 'Thank you Father Moran for such a wonderful experience and for all the help you have provided.' "

Father Moran had slightly different recollections of Tom's visit. "Tom worked over 6000 contacts on CW, which is good since I don't handle CW. However, he was a chain smoker, and I wouldn't let him use my shack. I ran coax around to the library and set him up on a table, where he could smoke his head off. 'Tom,' I said, 'I'm so sorry about your wife and family, having to put up with that terrible smoking and your shortened life span.' I hear that Tom quit smoking after his return to Yugoslavia."

Between hosting visiting operators, Father Moran continues his efforts to expand amateur radio in Nepal. A few years ago some stateside and Japanese amateurs, including Rusty Epps W6OAT, operated a special-event station in celebration of the King's birthday. In preparation, Father Moran had loaned the Director of Communications of Nepal an unused receiver. Father Moran also loaned some coax and strung up an antenna for the Director. Soon the Director was avidly logging callsigns. During the birthday celebration, Father Moran personally guided the Director through the various amateur stations explaining the benefits of ham radio. Father Moran has also pleaded the case of amateur radio directly with the King of Nepal and has obtained written authorization for the amateur service. Perhaps this means that someday more than one amateur will be licensed in Nepal. Meanwhile we are all fortunate to have such an outstanding individual keeping 9N1 off the Most Wanted lists. Among the best aspects of DXing is the opportunity to meet and get to know wonderful people such as Father Marshall Moran 9N1MM.

Special thanks to Tom Dugec YU2DX and the Northern California DX Foundation (NCDXF) for parts of the above. The NCDXF sponsors DXpeditions, runs the 20-meter beacon system, and assists DXers worldwide. For more information on the NCDXF, write them at PO Box 2368, Stanford CA 94305 USA.

FATHER MORAN 9N1MM ON LIST OPERATIONS

Every Thursday I work stations off of a list. I do this because many amateurs still need a contact with Nepal. Some hams hate lists. I think that attitude is alright for the guys with lots of money and power and good locations. But what about the little guy with 100 Watts and a dipole and limited income? I am sure they get more fun out of the Nepal contact, and with the list they have a chance. Besides, I only operate from a list once a week; the other six days the Big Guns get their chance, so they shouldn't complain.

Father Marshall Moran 9N1MM is the father of amateur radio and the only licensed amateur in Nepal.

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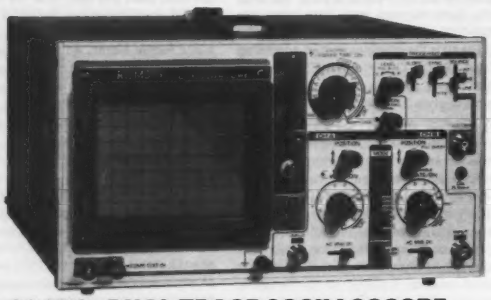

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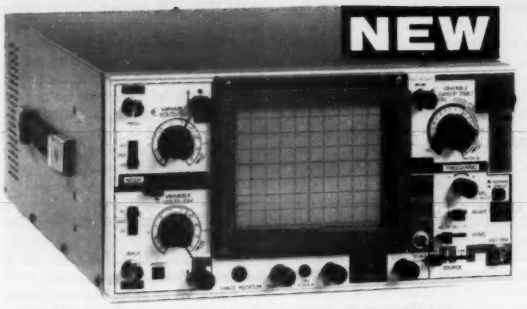

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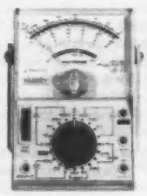

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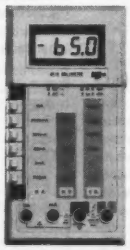

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Reliable, accurate digital measurements at an amazingly low cost • in-line color coded push buttons, speeds range selection • abs plastic tilt stand • recessed input jacks • overload protection on all ranges • 3½ digit LCD display with auto zero, auto polarity & low BAT. indicator

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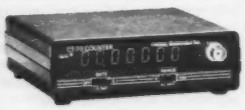

CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

$119.95 wired includes AC adapter

CT-70 kit $99.95
BP-4 nicad pack 8.95

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BP-4 nicad pack 8.95

CT-125 9 DIGIT 1.2 GHz COUNTER

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$169.95 wired includes AC adapter

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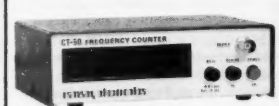

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Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

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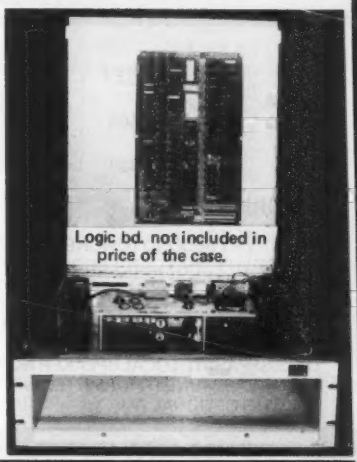
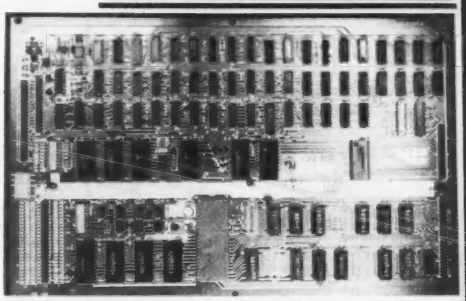
Dual 8" F. D. D. Case by SMS w/ POWER ONE Power Supply & Cooling Fans

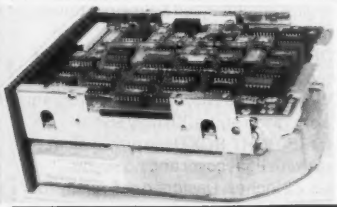
We were very fortunate to find these beautifully designed & constructed rack mount disc drive cases in the surplus field. These cases were made for Scientific Micro Systems for their FT Series of equipment. They are manufactured from heavy guage steel w/ a cast metal designer bezel. They were designed to house 2 8" floppy or hard drives. We offer you the case with the following components & features: hinged cover with restraining cable for simplified servicing of the interior components, 2 muffin fans for assured cool operation, studs for mounting the controller card listed below, and a heavy duty Power One power supply (their model no. CP 281A). The outputs of the power supply are as follows: +5 vdc 11 amps, +24 vdc 3.5 amps, +12 vdc .25 amps, -12 vdc .25 amps, & -5 vdc .25 amps. The input to the power supply is 115/230 vac 50/60 Hz. and is both filtered and fused. This assembly must have originally sold for well over $300.00 each ! Only 25 on hand, so order early or be left out on this super bargain ! Shpg. wt. 38 lb. SPL-479-35 $135.00 each



Scientific Micro Systems IBM 3740 Compatible 8" FDD Controller Card

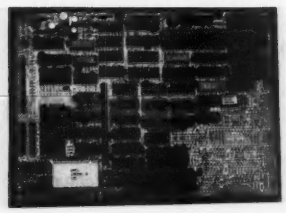
The SMS FD 0502 8" floppy disc drive controller is a complete preprogrammed controller for single or double density recording on either single or dual headed disc drives. It performs control functions required to transfer data between 1 to 4 drives and a host system, performs all formatting functions required to read and write data and utilizes both IBM single and double density standards to achieve up to 630 Kilobytes of storage per disc surface. Some features are: programmable sector size, 128, 256, 512, or 1024 bytes, jumper selectable drive type, block transfer mode, sector buffer, overlapped head seek, on board General Purpose Host Interface with asynchronous 19 TTL signal lines for eight bit host system and input of only 5 vdc 6 amps. This board provides a direct interface to the following drives: Shugart 800-2/850, Pertec 511, Memorex 550/552, MFE 751B, Qume Data Trak and similiar drives. These boards were removed from the above cabinets which were in service prior to our reception of them. The manufacturers price on these IBM compatible boards is currently $900.00 each. These boards all appear to be in excellent condition. If more information is needed, please call us. Shpg. wt. 3 lb. SPL 480 $150.00





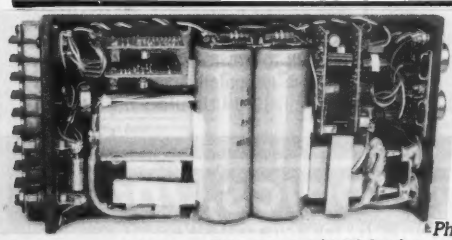
SEAGATE TECHNOLOGY ST 506 5¼" HARD DRIVES

The Seagate Technology ST 506 hard disc drive utilizes proven Winchester teacnology for reliable storage of up to 5 megabytes of formatted data. Some features of this very popular drive are: 5 megabit/second data transfer rate, simple floppy like interface, high speed band actuator & stepper head positioning, requires only +5 & +12 vdc, and same physical size and mounting paramters as a mini floppy drive. This Shugart compatible drive is the same as used on many home personal computers. Each drive is checked out prior to shipment. Comes with data. Only a few on hand, so order early.
Shpg. wt. 8 lb. ST-506 $225.00



5 ¼" HARD DRIVE CONTROLLER CARD

Finally, affordable, intelligent disc drive controllers are available at low, low surplus prices. The OMTI 20C controller boards we offer are unused, late style, surplus from a now defunct system house. OMTI is a division of Scientific Micro Systems. These boards will handle up to (2) 5¼ inch Winchester type hard drives that utilize a standard 34 pin SASI interface. Perfect for using with the above Seagate ST 506 drive, or other hard drives from 5 megabytes of storage on up. The controllers have buffered slew/seek modes, overlapped seeks, auto seek & verify, extensive fault detection, auto head & cylinder switching, full sector buffering, 256/512 bytes/sector, 33 or 18 sectors/track (jumper selectable), programmable disc parameters and much more. The board runs on +5 vdc & +12 vdc.. We supply users manual & pinout data. Guaranteed O. K..
Shpg. wt. 3 lb. OMTI 20 C $150.00 each 2/$275.00 Qty. pricing available.



5 VDC 25 AMP SWITCHING POWER SUPPLY

We just got in a small lot of ruggedly built, lightweight (4 lb.), compact (11" x 5" x 1½"), fully enclosed (cover removed for pic.), regulated, switching, power supplies made by RO Industries. Input of 115/230 vac is attached thru convenient, clearly marked screw terminals. The hefty 5 vdc 25 amp output is via heavy duty, brass lugs with a Red LED sta tus indicator. All appear to be unused and in excellent condition.
Shpg. wt. 6 lb. PS-8 $50.00

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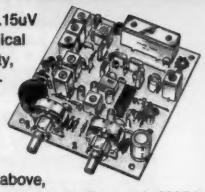
Band	Kit	Wired
10M,6M, 2M,220	$680	$880
440	$780	$980

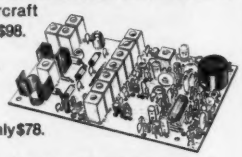
FEATURES:

- SENSITIVITY SECOND TO NONE; 0.15 uV (VHF), 0.2 uV (UHF) TYP.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE XTAL FILTER & CERAMIC FILTER FOR > 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS TO FIGHT DESENSE & INTERMOD.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).

HIGH QUALITY XMTR & RCVR MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.



- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.; 8 pole xtal filter & ceramic filter in i–f, helical resonator front end for exceptional selectivity, > 100 dB at ± 12 kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, or 220. As above, but w/o AFC or hel. res. Kits only $118. Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft or ham bands or Space Shuttle. Only $98.



- **T51 VHF FM EXCITER** for 10M, 6M, 2M, or 220 MHz. 2 Watts continuous, up to 3 W intermittent. $68/kit.
- **T451 UHF FM EXCITER** 2 to 3 Watts. Kit only $78. Xtal oven avail.
- **VHF & UHF LINEAR AMPLIFIERS.** For either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.

NOW—FCC TYPE-ACCEPTED TRANSMITTERS & RECEIVERS AVAILABLE FOR HIGH-BAND & UHF. CALL FOR DETAILS.

RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

		Antenna Input Range	Receiver Output
VHF MODELS		28–32	144–148
		50–52	28–30
Kit with Case	$49	50–54	144–148
Less Case	$39	144–146	28–30
Wired	$89	145–147	28–30
		144–144.4	27–27.4
		146–148	28–30
		144–148	50–54
		220–222	28–30
		220–224	144–148
		222–226	144–148
		220–224	50–54
		222–224	28–30
UHF MODELS			
		432–434	28–30
Kit with Case	$59	435–437	28–30
Less Case	$49	432–436	144–148
Wired	$75	432–436	50–54
		439.25	61.25

SCANNER CONVERTERS Copy 806 MHz band on any scanner. Wired/tested ONLY $88.

TRANSMIT CONVERTERS

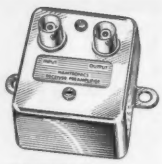
For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

	Exciter Input Range	Antenna Output
For VHF, Model XV2 Kit $79 Wired $149 (Specify band)	28-30	144-146
	28–29	145–146
	28–30	50–52
	27–27.4	144–144.4
	28–30	220–222*
	50–54	220–224
	144–146	50–52
	50–54	144–148
	144–146	28–30
For UHF, Model XV4 Kit $99 Wired $169	28–30	432–434
	28–30	435–437
	50–54	432–436
	61.25	439.25
	144–148	432–436*

*Add $20 for 2M input

VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOW-NOISE PREAMPS



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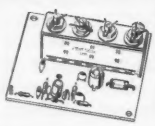
FEATURES:

- Very Low Noise: 0.7 dB VHF, 0.8 dB UHF
- High Gain: 18 to 28 dB, Depending on Freq.
- Wide Dynamic Range for Overload Resistance
- Latest Dual-gate GaAs FET, Very Stable

MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-160	150-172 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-800	800-960 MHz	$49

HELICAL RESONATOR PREAMPS

Low-noise preamps with helical resonators reduce intermod and cross-band interference in critical applications. 12 dB gain.



Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174 MHz	$54
HRA-( )	450-470 MHz	$64

ACCESSORIES

- **MO-202 FSK DATA MODULATOR.** Run up to 1200 baud digital or packet radio signals through any FM transmitter. Automatically keys transmitter and provides handshakes. 1200/2200 Hz tones. Kit only $45.
- **DE-202 FSK DATA DEMODULATOR.** Use with any FM receiver to detect packet radio or other digital data in "202" modem format. Provides audio conditioning and handshakes. Kit only $38.
- **COR-2 KIT** With audio mixer, local speaker amplifier, tail & time-out timers. Only $38.
- **COR-3 KIT** as above, but with "courtesy beep". Only $58.
- **CWID KITS** 158 bits, easily field programmable, clean audio. Kit only $68.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 × 8 × 2 inches. Designed especially for repeaters. $20.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $90. Requires DTMF Module.
- **SIMPLEX AUTOPATCH.** Use with your FM transceiver. System includes DTMF & Autopatch modules above and new Timing module to provide simplex autopatch and reverse autopatch. Complete patch system only $200/kit. Call or write for details.

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TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 34.00	1182/4600A	$500.00	ML7815AL	$ 60.00
2E26	7.95	4600A	500.00	7843	107.00
2K28	200.00	4624	310.00	7854	130.00
3-500Z	102.00	4657	84.00	ML7855KAL	125.00
3-1000Z/8164	400.00	4662	100.00	7984	14.95
3B28/866A	9.50	4665	500.00	8072	84.00
3CX400U7/8961	255.00	4687	P.O.R.	8106	5.00
3CX1000A7/8283	526.00	5675	42.00	8117A	225.00
3CX3000F1/8239	567.00	5721	250.00	8121	110.00
3CW30000H7	1700.00	5768	125.00	8122	110.00
3X2500A3	473.00	5819	119.00	8134	470.00
3X3000F1	567.00	5836	232.50	8156	12.00
4-65A/8165	69.00	5837	232.50	8233	60.00
4-125A/4D21	79.00	5861	140.00	8236	35.00
4-250A/5D22	98.00	5867A	185.00	8295/PL172	500.00
4-400A/8438	98.00	5868/AX9902	270.00	8458	35.00
4-400B/7527	110.00	5876/A	42.00	8462	130.00
4-400C/6775	110.00	5881/6L6	8.00	8505A	95.00
4-1000A/8166	444.00	5893	60.00	8533W	136.00
4CX250B/7203	54.00	5894/A	54.00	8560/A	75.00
4CX250FG/8621	75.00	5894B/8737	54.00	8560AS	100.00
4CX250K/8245	125.00	5946	395.00	8608	38.00
4CX250R/7580W	90.00	6083/AZ9909	95.00	8624	100.00
4CX300A/8167	170.00	6146/6146A	8.50	8637	70.00
4CX350A/8321	110.00	6146B/8298	10.50	8643	83.00
4CX350F/8322	115.00	6146W/7212	17.95	8647	168.00
4CX350FJ/8904	140.00	6156	110.00	8683	95.00
4CX600J/8809	835.00	6159	13.85	8877	465.00
4CX1000A/8168	242.50*	6159B	23.50	8908	13.00
4CX1000A/8168	485.00	6161	325.00	8950	13.00
4CX1500B/8660	555.00	6280	42.50	8930	137.00
4CX5000A/8170	1100.00	6291	180.00	6L6 Metal	25.00
4CX10000D/8171	1255.00	6293	24.00	6L6GC	5.03
4CX15000A/8281	1500.00	6326	P.O.R.	6CA7/EL34	5.38
4CW800F	710.00	6360/A	5.75	6CL6	3.50
4D32	240.00	6399	540.00	6DJ8	2.50
4E27A/5-125B	240.00	6550A	10.00	6DQ5	6.58
4PR60A	200.00	6883B/8032A/8552	10.00	6GF5	5.85
4PR60B	345.00	6897	160.00	6GJ5A	6.20
4PR65A/8187	175.00	6907	79.00	6GK6	6.00
4PR1000A/8189	350.00	6922/6DJ8	5.00	6HB5	6.00
4X150A/7034	60.00	6939	22.00	6HF5	8.73
4X150D/7609	95.00	7094	250.00	6JG6A	6.28
4X250B	45.00	7117	38.50	6JM6	6.00
4X250F	45.00	7203	P.O.R.	6JN6	6.00
4X500A	412.00	7211	100.00	6JS6C	7.25
5CX1500A	660.00	7213	300.00*	6KN6	5.05
KT88	27.50	7214	300.00*	6KD6	8.25
416B	45.00	7271	135.00	6LF6	7.00
416C	62.50	7289/2C39	34.00	6LQ6 G.E.	7.00
572B/T160L	49.95	7325	P.O.R.	6LQ6/6MJ6 Sylvania	9.00
592/3-200A3	211.00	7360	13.50	6ME6	8.90
807	8.50	7377	85.00	12AT7	3.50
811A	15.00	7408	2.50	12AX7	3.00
812A	29.00	7609	95.00	12BY7	5.00
813	50.00	7735	36.00	12JB6A	6.50

NOTE * = USED TUBE

NOTE P.O.R. = PRICE ON REQUEST

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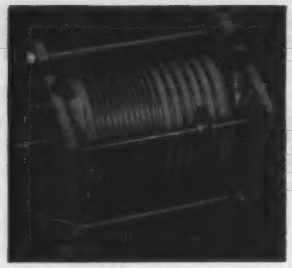
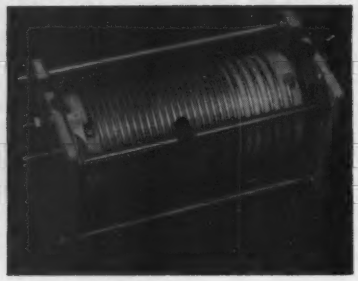


MODEL 229-0201-01
10UH at 3AMPS MAX. $36.99



MODEL 229-0202-01
18UH at 5AMPS MAX. $44.99

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5	18	36	75	200	7	33
5.1	20	38	80	220	8	36
6.8	22	39	82	240	9	51
7	24	40	100	250	12	62
8.2	25	43	110	300	15	
9.1	27	44	120	360	16	
10	27.5	47	123	470	18	
11	28	50	125	500	20	
12	30	51	140	820	22	
13	32	56	150	1000	24	

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12v at 5AMPHR 6 X Cells	used	e	24.99

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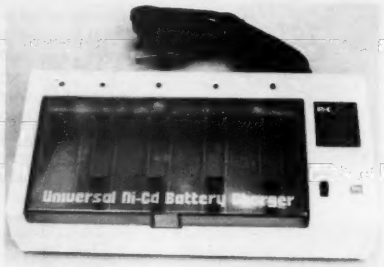
NI-CAD BATTERY CHARGERS



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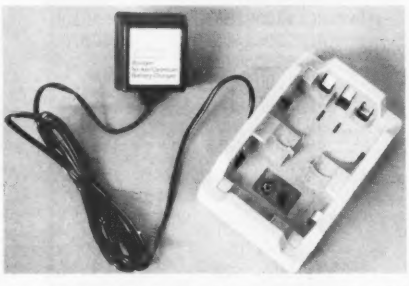

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2N1692	25.00	2N5922	10.00	40894 RCA	1.00	BLX67	12.25
2N2857	1.55	2N5923	25.00	60247 RCA	25.00	BLX67C3	12.25
2N2857JAN	4.10	2N5941	23.00	61206 RCA	100.00	BLX93C3	22.21
2N2857JANTX	4.50	2N5942	40.00	62800A RCA	60.00	BLY87A	7.50
2N2876	13.50	2N5944	10.35	62803 RCA	100.00	BLY88C3	13.08
2N2947	18.35	2N5945	10.00	430414/3990RCA	50.00	BLY89C	13.00
2N2948	13.00	2N5946	12.00	3457159 RCA	20.00	BLY90	45.00
2N2949	15.50	2N5947	9.20	3729685-2 RCA	75.00	BLY92	13.30
2N3118	5.00	2N6080	6.00	3729701-2 RCA	50.00	BLY94C	45.00
2N3119	4.00	2N6081	7.00	3753883 RCA	50.00	BLY351	10.00
2N3134	1.15	2N6082	9.00	615467-902	25.00	BLY568C/CF	30.00
2N3287	4.90	2N6083	9.50	615467-903	40.00	C2M70-28R	92.70
2N3288	4.40	2N6084	12.00	2SC568	2.50	C25-28	57.00
2N3309	4.85	2N6094	11.00	2SC703	36.00	C4005	2.50
2N3375	17.10	2N6095	12.00	2SC756A	7.50	CD1659	20.00
2N3478	2.13	2N6096	16.10	2SC781	2.80	CD1899	20.00
2N3553	1.55	2N6097	20.70	2SC1018	1.00	CD1920	10.00
2N3553JAN	2.90	2N6105	21.00	2SC1042	24.00	CD2188	18.00
2N3632	15.50	2N6136	21.85	2SC1070	2.50	CD2545	24.00
2N3733	11.00	2N6166	40.24	2SC1216	2.50	CD2664A	16.00
2N3818	5.00	2N6267	142.00	2SC1239	2.50	CD3167	92.70
2N3866	1.30	2N6304	1.50	2SC1251	24.00	CD3353	95.00
2N3866JAN	2.20	2N6368	30.00	2SC1306	2.90	CD3435	26.30
2N3866JANTX	3.80	2N6439	55.31	2SC1307	5.50	CD3900	152.95
2N3866JANTXV	4.70	2N6459	18.00	2SC1424	2.80	CM25-12	20.00
2N3866AJANTXV	5.30	2N6567	10.06	2SC1600	5.00	CM40-12	27.90
2N3924	3.35	2N6603	13.50	2SC1678	2.00	CM40-28	56.90
2N3926	16.10	2N6604	13.50	2SC1729	32.40	CME50-12	30.00
2N3927	17.25	2N6679	44.00	2SC1760	1.50	CTC2001	42.00
2N3948	1.75	2N6680	80.00	2SC1909	4.00	CTC2005	55.00
2N3950	25.00	021-1	15.00	2SC1945	10.00	CTC3005	70.00
2N3959	3.85	01-80703T4	65.00	2SC1946	40.00	CTC3460	20.00
2N4012	11.00	35C05	15.00	2SC1947	10.00	DV2820S	25.00
2N4037	2.00	102-1	28.00	2SC1970	2.50	DXL1003P70	22.00
2N4041	14.00	103-1	28.00	2SC1974	4.00	DXL2001P70	19.00
2N4072	1.80	103-2	28.00	2SC2166	5.50	DXL2002P70	14.00
2N4080	4.53	104P1	18.00	2SC2237	32.00	DXL3501AP100F	47.00
2N4127	21.00	163P1	10.00	2SC2695	47.00	EFJ4015	12.00
2N4416	2.25	181-3	15.00	A2X1698	POR	EFJ4017	24.00
2N4427	1.25	210-2	10.00	A3-12	14.45	EFJ4021	24.00
2N4428	1.85	269-1	18.00	A50-12	24.00	EFJ4026	35.00
2N4430	11.80	281-1	15.00	A209	10.00	EN15745	20.00
2N4927	3.90	282-1	30.00	A283	6.00	FJ9540	16.00
2N4957	3.45	482	7.50	A283B	6.00	FSX52WF	58.00
2N4959	2.30	564-1	25.00	A1610	19.00	G65739	25.00
2N5016	18.40	698-3	15.00	AF102	2.50	G65386	25.00
2N5026	15.00	703-1	15.00	AFY12	2.50	GM0290A	2.50
2N5070	18.40	704	4.00	AR7115	20.00	HEP76	4.95
2N5090	13.80	709-2	11.00	AT41435-5	6.35	HEPS3002	11.40
2N5108	3.45	711	4.00	B2-82	10.70	HEPS3003	30.00
2N5109	1.70	733-2	15.00	B3-12	10.85	HEPS3005	10.00
2N5160	3.45	798-2	25.00	B12-12	15.70	HEPS3006	19.90
2N5177	21.62	3421	28.00	BAL0204125	152.95	HEPS3007	25.00
2N5179	1.04	3683P1	15.00	BF25-35	56.25	HEPS3010	11.34
2N5216	56.00	3992	25.00	B40-12	19.25	HF8003	10.00
2N5470	75.00	4164P1	15.00	B70-12	55.00	HFET2204	112.00
2N5583	3.45	4243P1	28.00	BF272A	2.50	HP35821	38.00
2N5589	9.77	4340P3	18.00	BFQ85	2.50	HP35826B	32.00
2N5590	10.92	4387P1	27.50	BFR21	2.50	HP35826E	32.00
2N5591	13.80	7104-1	28.00	BFR90	1.00	HP35831E	30.00
2N5596	99.00	7249-2	10.50	BFR91	1.65	HP35832E	50.00
2N5636	12.00	7283-1	37.50	BFR99	2.50	HP35833E	50.00
2N5637	15.50	7536-1	30.00	BFT12	2.50	HP35859E	75.00
2N5641	12.42	7794-1	10.50	BFW16A	2.50	HP35866E	44.00
2N5642	14.03	7795	15.00	BFW17	2.50	HXTR2101	44.00
2N5643	25.50	7795-1	15.00	BFW92	1.50	HXTR3101	7.00
2N5645	13.80	7796-1	24.00	BFX44	2.50	HXTR5101	31.00
2N5646	20.70	7797-1	36.00	BFX48	2.50	HXTR6104	68.00
2N5651	11.05	40081 RCA	5.00	BFX65	2.50	HXTR6105	31.00
2N5691	18.00	40279 RCA	10.00	BFX84	2.50	HXTR6106	33.00
2N5764	27.00	40280 RCA	4.62	BFX85	2.50	J310	1.00
2N5836	3.45	40281 RCA	10.00	BFX86	2.50	JO2000	10.00
2N5842	8.45	40282 RCA	20.00	BFX89	1.00	JO2001	25.00
2N5847	19.90	40290 RCA	2.80	BFY11	2.50	JO4045	24.00
2N5849	20.00	40292 RCA	13.05	BFY18	2.50	KD5522	25.00
2N5913	3.25	40294 RCA	2.50	BFY19	2.50	KJ5522	25.00
2N5916	36.00	40341 RCA	21.00	BFY39	2.50	M1106	13.75

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M1107	$16.75	MRF458	$20.70	NEO2160ER	$100.00	SD1009	$15.00
M1131	5.15	MRF464	25.30	NEO21350	5.30	SD1009-2	15.00
M1132	7.25	MRF466	18.97	NE13783	61.00	SD1012	10.00
M1134	13.40	MRF472	1.50	NE21889	43.00	SD1012-3	10.00
M9116	29.10	MRF475	3.10	NE57835	5.70	SD1012-5	10.00
M9579	6.00	MRF476	3.16	NE64360ER-A	100.00	SD1013	10.00
M9580	7.95	MRF477	20.00	NE64480 (B)	94.00	SD1013-3	10.00
M9587	7.00	MRF479	8.05	NE73436	2.50	SD1013-7	10.00
M9588	5.20	MRF492	23.00	NE77362ER	100.00	SD1016	15.00
M9622	5.95	MRF502	1.04	NE98260ER	100.00	SD1016-5	15.00
M9623	7.95	MRF503	6.00	PRT8637	25.00	SD1018-4	13.00
M9624	9.95	MRF504	7.00	PT3127A	5.00	SD1018-6	13.00
M9625	15.95	MRF509	5.00	PT3127B	5.00	SD1018-7	13.00
M9630	14.00	MRF511	10.69	PT3127C	20.00	SD1018-15	13.00
M9740	27.90	MRF515	2.00	PT3127D	20.00	SD1020-5	10.00
M9741	27.90	MRF517	2.00	PT3127E	20.00	SD1028	15.00
M9755	16.00	MRF525	3.45	PT3190	20.00	SD1030	12.00
M9780	5.50	MRF559	1.76	PT3194	20.00	SD1030-2	12.00
M9827	11.00	MRF587	11.00	PT3195	20.00	SD1040	5.00
M9848	35.00	MRF605	20.00	PT3537	7.80	SD1040-2	20.00
M9850	13.50	MRF618	25.00	PT4166E	20.00	SD1040-4	10.00
M9851	20.00	MRF626	12.00	PT4176D	25.00	SD1040-6	5.00
M9860	8.25	MRF628	8.65	PT4186B	5.00	SD1043	12.00
M9887	2.80	MRF629	3.45	PT4209	25.00	SD1043-1	10.00
M9908	6.95	MRF641	25.30	PT4209C/5645	25.00	SD1045	3.75
M9965	12.00	MRF644	27.60	PT4556	24.60	SD1049-1	2.00
MM1500	25.00	MRF646	29.90	PT4570	7.50	SD1053	4.00
MM1550	10.00	MRF648	33.35	PT4577	20.00	SD1057	10.00
MM1552	50.00	MRF816	15.00	PT4590	5.00	SD1065	4.75
MM1553	50.00	MRF823	20.00	PT4612	20.00	SD1068	15.00
MM1607	8.45	MRF846	44.85	PT4628	20.00	SD1074-2	18.00
MM1614	10.00	MRF892	35.50	PT4640	20.00	SD1074-4	28.00
MM1810	15.00	MRF894	46.00	PT4642	20.00	SD1074-5	28.00
MM1810	15.00	MRF901 3 Lead	1.00	PT5632	4.70	SD1076	18.50
MM1943	1.80	MRF901 4 Lead	2.00	PT5749	25.00	SD1077	4.00
MM2608	5.00	MRF902/2N6603JAN	15.00	PT6612	25.00	SD1077-4	4.00
MM3375A	17.10	MRF902B	18.40	PT6619	20.00	SD1077-6	4.00
MM4429	10.00	MRF904	2.30	PT6708	25.00	SD1078-6	24.00
MM8000	1.15	MRF905	2.55	PT6709	25.00	SD1080-7	7.50
MM8006	2.30	MRF911	2.50	PT6720	25.00	SD1080-8	6.00
MM8011	25.00	MRF965	2.55	PT8510	15.00	SD1080-9	3.00
MPSU31	1.01	MRF966	3.55	PT8524	25.00	SD1084	8.00
MRA2023-1.5	42.50	MRF1000MA	32.77	PT8609	25.00	SD1087	15.00
MRF134	10.50	MRF1004M	31.05	PT8633	25.00	SD1088	22.00
MRF136	16.00	MRF2001	41.74	PT8639	25.00	SD1088-8	22.00
MRF171	35.00	MRF2005	54.97	PT8659	25.00	SD1089-5	15.00
MRF208	11.50	MRF5176	24.00	PT8679	25.00	SD1090	15.00
MRF212	16.10	MRF8004	2.10	PT8708	20.00	SD1094	15.00
MRF221	10.00	MSC1720-12	225.00	PT8709	20.00	SD1095	15.00
MRF223	13.00	MSC1821-3	125.00	PT8727	29.00	SD1098-1	30.00
MRF224	13.50	MSC1821-10	225.00	PT8731	25.00	SD1100	5.00
MRF227	3.45	MSC2001	30.00	PT8742	19.10	SD1109	18.00
MRF230	2.00	MSC2010	93.00	PT8787	25.00	SD1115-2	7.50
MRF231	10.00	MSC2223-10	245.00	PT8828	25.00	SD1115-3	7.50
MRF232	12.07	MSC2302	POR	PT9700	25.00	SD1115-7	2.10
MRF237	3.15	MSC3000	35.00	PT9702	25.00	SD1116	5.00
MRF238	13.80	MSC3001	38.00	PT9783	16.50	SD1118	22.00
MRF239	17.25	MSC72002	POR	PT9784	32.70	SD1119	5.00
MRF245	35.65	MSC73001	POR	PT9790	56.00	SD1124	50.00
MRF247	31.00	MSC80064	35.00	PT31083	20.00	SD1132-1	15.00
MRF304	36.00	MSC80091	10.00	PT31962	20.00	SD1132-4	12.00
MRF306	50.00	MSC80099	3.00	PTX6680	20.00	SD1133	9.50
MRF313	11.15	MSC80593	POR	RE3754	25.00	SD1133-1	10.00
MRF314	29.21	MSC80758	POR	RE3789	25.00	SD1134-1	2.50
MRF315	28.86	MSC82001	33.00	RF35	16.00	SD1134-4	12.00
MRF316	55.43	MSC82014	33.00	RF85	17.50	SD1134-17	12.00
MRF317	63.94	MSC82020M	130.00	RF110	21.00	SD1135	10.25
MRF412	18.00	MSC82030	33.00	S50-12	23.80	SD1135-3	12.00
MRF420	20.12	MSC83001	40.00	S3006	15.00	SD1136	12.50
MRF421	25.00	MSC83003	82.00	S3007	10.00	SD1136-2	12.50
MRF422	38.00	MSC83005	70.00	S3031	22.00	SD1143-1	10.00
MRF427	17.25	MSC83026	POR	SCA3522	5.00	SD1143-3	17.00
MRF428	63.00	MSC83303	POR	SCA3523	5.00	SD1144	4.00
MRF433	12.07	MSC84900	60.00	SD345	5.00	SD1145-5	15.00
MRF449/A	12.65	MT4150	14.40	SD445	5.00	SD1146	15.00
MRF450/A	14.37	MT5126	25.00	SD1004	15.00	SD1147	15.00
MRF452/A	17.00	MT5596(2N)	99.00	SD1007	15.00	SD1188	10.00
MRF453/A	18.40	MT5768(2N)	95.00	SD1007-2	15.00	SD1189	24.00
MRF454/A	20.12	MT8762	25.00	SD1007-4	15.00	SD1200	1.50
MRF455/A	16.00	NEO2136	2.00	SD1007-5	15.00	SD1201-2	15.00

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SD1202	$10.00	SD1304-8	$ 2.50	SD1451-2	$15.00	SRF1427	$50.00	SD1244H12	25.00	SD1410-8	21.00	SD1536-1	41.00	SRF2917	15.00
SD1212-8	4.95	SD1305	3.00	SD1452	20.00	SRF1431	40.00	SD1262	15.00	SD1413-1	18.00	SD1539H	100.00	SRF2918	15.00
SD1212-11	4.95	SD1307	3.00	SD1452-4	24.00	SRF1834	40.00	SD1263	15.00	SD1416	28.00	SD1542H	170.00	SRF2919	15.00
SD1212-16	4.95	SD1308	3.00	SD1453H	20.00	SRF2053-3	60.00	SD1263-1	15.00	SD1422-2	24.00	SD1546	26.00	SRF3071FF	50.00
SD1214-7	5.00	SD1311	1.00	SD1456-1	48.00	SRF2092	50.00	SD1272	10.95	SD1428	24.00	SD1545	33.00	SS4006	25.00
SD1214-11	5.00	SD1317	8.00	SD1477	35.00	SRF2147	22.00	SD1272-1	10.95	SD1428- 6084	12.00	SD1546H	55.00	SS4152	15.00
SD1216	12.00	SD1319	2.50	SD1478	21.00	SRF2225	15.00	SD1272-2	10.95	SD1429-2	15.00	SD1561	79.00	TA7686	15.00
SD1219-4	15.00	SD1345-6	5.00	SD1480	53.00	SRF2264	25.00	SD1272-4	10.95	SD1429-3	14.90	SD1574-1	6.95	TA8559	15.00
SD1219-5	15.00	SD1347-1	1.00	SD1484	1.50	SRF2265	100.00	SD1278	13.75	SD1429-5	15.00	SD1575	6.95	TA8561	15.00
SD1219-8	15.00	SD1365-1	2.50	SD1484-5	1.50	SRF2281	5.00	SD1278-1	13.75	SD1430	12.00	SF4557	25.00	TA8562	15.00
SD1220	8.00	SD1365-5	2.50	SD1484-6	1.50	SRF2371	15.00	SD1278-5	13.75	SD1430-2	18.00	SK3048	5.00	TA8563	15.00
SD1220-1	9.50	SD1375	7.50	SD1484-7	1.50	SRF2347	50.00	SD1279-1	18.00	SD1434	28.00	SL501-59	15.00	TA8566	15.00
SD1220-9	8.00	SD1375-6	7.50	SD1488	22.85	SRF2356	38.00	SD1279-3	18.00	SD1434-5	28.00	SL501-173	15.00	TA8894	15.00
SD1222-8	16.00	SD1379	15.00	SD1488-1	28.00	SRF2378	16.00	SD1281-2	8.00	SD1434-9	28.00	SM7714	5.00	TIS189	3.55
SD1222-11	7.50	SD1380-1	1.00	SD1488-7	27.00	SRF2572	25.00	SD1283	10.00	SD1438	26.00	SRF112	15.00	TP312	2.50
SD1224-10	18.00	SD1380-3	1.00	SD1488-8	28.00	SRF2584	40.00	SD1283-2	10.60	SD1441	56.00	SRF395	50.00	TP1014	5.00
SD1225	18.00	SD1380-7	1.00	SD1499-1	36.00	SRF2597	25.00	SD1283-3	10.00	SD1442	15.00	SRF/50	36.00	TP1028	15.00
SD1225-1	15.00	SD1405	21.00	SD1511H3	75.00	SRF2741	40.00	SD1283-4	10.00	SD1444	3.25	SRF769H	20.00	TRW3	5.00
SD1229-7	10.95	SD1408	25.00	SD1520-2	18.00	SRF2747	40.00	SD1289-1	15.00	SD1444-8	3.25	SRF887K3	2.50	XA??2201/HF	450.00
SD1229-16	10.95	SD1409	18.00	SD1522-6	33.00	SRF2767H	40.00	SD1290-4	15.00	SD1444-9	3.25	SRF989K	15.00	V222-2	25.00
SD1232	4.00	SD1410	18.00	SD1528-1	24.00	SRF2821	25.00	SD1290-7	15.00	SD1446	4.03	SRF1005	50.00	V410IE	20.00
SD1240-8	15.00	SD1410-3	21.00	SD1528-3	34.00	SRF2822/2N6603	13.50	SD1300	1.25	SD1450-1	28.00	SRF1018	5.00	V415	5.00
SD1244-1	14.00	SD1410-6	21.00	SD1530-2	38.00	SRF2857	20.00	SD1301-7	3.00	SD1451	15.00	SRF1074	50.00		

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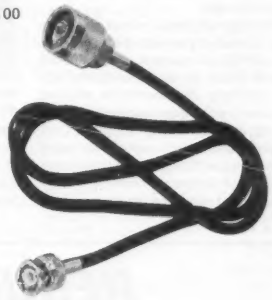

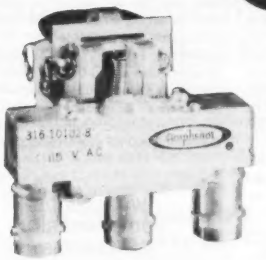

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CONFIRMING ORDERS: We would prefer that confirming orders not be sent after a telephone order has been placed. If company policy necessitates a confirming order, please mark "CONFIRMING" boldly on the order. If problems or duplicate shipments occur due to an order which is not properly marked, the customer will be held responsible for any charges incurred, plus a 15% restock charge on the returned parts.

CREDIT CARDS: We are now accepting MASTERCARD, VISA, AND AMERICAN EXPRESS

DATA SHEETS: When we have data sheets in stock on devices we will supply them with the order.

DEFECTIVE MATERIALS: All claims for defective materials must be made within 30 DAYS after receipt of the parcel. All claims must include the defective material (for testing purposes), a copy of our invoice, and a return authorization number which must be obtained prior to shipping the merchandise back to us. This can be obtained by calling (602) 242-8916 or sending us a postcard. Due to Manufacturer warranties we are unable to replace or issue credit on items which have been soldered to or have been altered in any way. All return items must be packed properly or it will void all warranties. We do not assume responsibility for shipping and handling charges incurred.

DELIVERY: Orders are usually shipped the same day they are placed or the next business day, unless we are out of stock on an item. The customer will be notified by post card if we are going to backorder the item. Our normal shipping method is UPS or U.S. Mail depending on size or the weight of the package. Test Equipment is shipped only by air and is freight collect, unless prior arrangements have been made and approved.

FOREIGN ORDERS: All foreign orders must be prepaid with a Cashier's Check, or Money Order made out in U.S. FUNDS ONLY. We are sorry but C.O.D. is not available to foreign countries and letters of credit are unacceptable as a form of payment. Further information is available on request.

HOURS: Monday thru Friday 8:30 a.m. to 5:00 p.m. Saturdays 8:30 a.m. to 4:00 p.m..

INSURANCE: Please include 25¢ for each additional $100.00 over $100.00, UPS ONLY. All insured packages are shipped thru UPS only. If you wish to have it shipped through the post office there is a $5.00 fee which is additional to the shipping, handling and insurance.

OPEN ACCOUNTS: We regret that we do not issue open accounts.

ORDER FORMS: New order forms are included with each order for your convenience. Additional order forms are available on request.

PARTS: We reserve the right to substitute or replace any item with a part of equal or comparable specification.

POSTAGE: Minimum shipping and handling in the U.S., Canada, and Mexico is $3.00 for ground shipments, all other countries is $5.50. Air rates are available at the time of your order. All foreign orders please include 25% of the ordered amount for shipping and handling. C.O.D.'s are shipped AIR ONLY.

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PRICES: Prices are subject to change without notice.

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RESTOCK CHARGES: If parts are returned to MHZ ELECTRONICS, INC. due to customer error, the customer will be held responsible for all fees incurred and will be charged a 15% RESTOCK CHARGE with the remainder in CREDIT ONLY. The following must accompany any return; A copy of our invoice, return authorization number which must be obtained prior to shipping the merchandise back. Returns must be done within 10 DAYS of receipt of parcel. Return authorization numbers can be obtained by calling (602) 242-8916 or notifying us by post card. Return authorizations will not be given out on our 800 number.

SALES TAX: ARIZONA residents must add 6% sales tax, unless a signed ARIZONA resale tax card is currently on file with us. All orders placed by persons outside of ARIZONA, but delivered to persons in ARIZONA are subject to the 6% sales tax.

SHORTAGE OR DAMAGE: All claims for shortages or damages must be made within 5 DAYS of receipt of parcel. Claims must include a copy of our invoice, along with a return authorization number which can be obtained by contacting us at (602) 242-8916 or sending a post card. Authorizations cannot be on our 800 number. All items must be properly packed. If items are not properly packed make sure to contact the carrier so that they can come out and inspect the package before it is returned to us. Customers which do not notify us within this time period will be held responsible for the entire order as we will consider the order complete.

OUR 800 NUMBER IS STRICTLY FOR ORDERS ONLY (800) 528-0180. INFORMATION CALLS ARE TAKEN ON (602) 242-8916 or (602) 242-3037.

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3802 N. 27th Ave. Phoenix, AZ 05017

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CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ARRL VHF QSO PARTY
Starts: 1800 UTC June 8
Ends: 0300 UTC June 9

Sponsored by the ARRL, the object is to work as many amateur stations in as many different ARRL sections and countries as possible using authorized amateur frequencies above 50 MHz. Note that these rules were taken from previous years' contests and no changes were anticipated. This year's rules were not available early enough to make this column, so you may want to check *QST* for any last-minute changes.

Operating categories include single operator using multi- or single band, or multi-operator. Single-operator stations must use one person for all operating and logging functions. Single-operator stations may submit single-band scores for 50, 144, 220, 432, and 1296-and-up categories. Contacts may be made on any and all bands without jeopardizing single-band-entry status. Such additional contacts are encouraged and should be reported.

Multi-operator stations must locate all equipment (including antennas) within a 300-meter-diameter circle.

Stations may be worked once per band, regardless of mode. Each QSO must be acknowledged; one-way exchanges do not count. Foreign stations may work only stations in the USA, Canada, and US possessions for contest credit.

Retransmitting either or both stations, or use of repeater frequencies is not permitted. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters to solicit contacts. Use of the national calling frequency, 146.52, or immediate adjacent guard frequencies is also prohibited. Only recognized simplex frequencies may be used, such as 144.90–145.10, 146.49/.55/.58, and 147.42/.45/.48/.51/.54/.57 MHz on the 2-meter band. Local option simplex channels and frequencies adjacent to the above that do not violate the intent of the contest rules or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory* may be used for contest purposes.

All operation must be fixed, portable, or mobile under one call from one ARRL section. A transmitter used to contact one or more stations cannot be used under any other call during the contest period, with the exception of family stations where more than one call is assigned to one location by FCC/DOC. Also, one operator may not give out contest QSOs using more than one callsign from any one location.

Only one signal per band at any given time is permitted, regardless of mode. While no minimum distance is specified for contacts, equipment should be capable of real communications (i.e., able to communicate over at least a mile). Multi-operator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

EXCHANGE:

Name of section, VE province, or DX country. Must be acknowledged by both operators for credit by either.

SCORING:

Count one point for each complete 50- or 144-MHz QSO, 2 points for 220 or 420 MHz, and 3 points for 1215 MHz and above. Crossband QSOs do not count.

Multipliers are each ARRL section in the contiguous 48 states (63 maximum), each Canadian province (maximum 12), and each DXCC country (excluding W and VE). Multipliers count once per band.

REPORTING:

Entries must be postmarked no later than July 11th and sent to the ARRL, 225 Main Street, Newington CT 06111. Official entry forms are available from the same address for an SASE. Usual ARRL disqualification rules apply. Usual awards to top scorers in each ARRL section, some limited to where significant effort or competition is evidenced. Multi-operator entries are not eligible for single-band awards.

WORLDWIDE SOUTH AMERICA CW CONTEST
Starts: 1500 UTC June 8
Ends: 1500 UTC June 9

Sponsored by *Electronica Popular* magazine of Rio de Janeiro, Brazil, this contest will be held annually on the second weekend of June. Use all bands, 80 through 10 meters, on CW only; crossband contacts are not valid. Only contacts between

RESULTS

1985 WORLD SSB CHAMPIONSHIP CONTESTS
CLAIMED SCORES

Callsign	QSOs	States/ Provinces	Countries	Claimed Score
20-Meter Single Op				
1. NR5M	1690	59	51	1,092,300
2. KA1GG	924	50	65	814,775
3. W1BR	904	54	58	775,040
4. W5FO	913	57	48	572,250
5. OK1TN	534	46	56	445,230
20-Meter Multi-Op				
1. K5LZO	1473	56	57	932,815
2. KE7C	1171	55	29	559,860
3. KA1YR	501	46	54	360,500
4. KD5RW	411	46	13	133,045
5. WB0OIZ	343	39	14	96,460
40-Meter Single Op				
1. KE5CV	1200	56	47	704,520
2. K4XS	1196	53	38	567,840
3. N6YK	1012	55	32	539,400
4. KE5IV	1009	53	30	443,635
5. NC2V	931	52	20	344,520
40-Meter Multi-Op				
1. K3TUP	1381	55	29	597,240
2. KY0S	1139	55	28	512,940
3. WA4JXI	990	57	32	468,585
4. N4DDS	1151	54	12	385,770
5. KS9O	946	55	22	374,990
160-Meter Single Op				
1. N7DF/0	1177	56	13	411,240
2. W0EJ	1152	56	13	401,580
3. KI2M	841	54	27	363,690
4. WB9NUL	575	55	9	282,880
5. W1ODY	690	47	15	228,690
160-Meter Multi-Op				
1. WB8IFP	1054	56	8	340,160
2. W0CEM	1084	56	5	332,450
3. W8RA	754	56	15	272,995
4. NO4R	871	53	8	268,095
5. WA4JXI	536	54	33	250,995

Claimed scores for the 15-meter and 75-meter events will appear in a future issue. Final results will appear this fall.

CALENDAR

Jun 8–9	Worldwide South America CW Contest
Jun 8–9	ARRL VHF QSO Party
Jun 22–23	ARRL Field Day
Jun 28–30	Summer SMIRK Party
Jul 1	CARF Canada Day Contest
Jul 13–14	IARU Radiosport Championship
Jul 20–22	CQ Worldwide VHF WPX Contest
Aug 3–4	ARRL UHF Contest
Aug 17–18	New Jersey QSO Party
Aug 17–18	SARTG Worldwide RTTY Contest
Sep 14–15	ARRL VHF QSO Party
Sep 14–16	Washington QSO Party
Sep 28–29	Late Summer QRP CW Activity Weekend
Oct 5–6	ARRL QSO Party—CW
Oct 12–13	Rio CW DX Contest
Oct 12–13	ARRL QSO Party—Phone
Oct 19–20	ARRL Simulated Emergency Test
Nov 2–3	ARRL Sweepstakes—CW
Nov 16–17	ARRL Sweepstakes—Phone
Dec 7–8	ARRL 160-Meter Contest
Dec 14–15	ARRL 10-Meter Contest

NEWSLETTER OF THE MONTH

Sunny southern California is the home of the Fresno Amateur Radio Club, publishers of *Skip*, June's Newsletter of the Month.

It's readily apparent that Editor Don Mayer N6EMV has his hands full covering the varied activities of this active and growing club. Yet Don somehow manages to include just about everyone in each issue, a trick that editors of faltering journals should make full use of.

Like many of our winners, *Skip* is printed in a magazine-like format which balances editorial content with paid advertising. The result is a professional-looking publication that nearly pays for itself!

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, 80 Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

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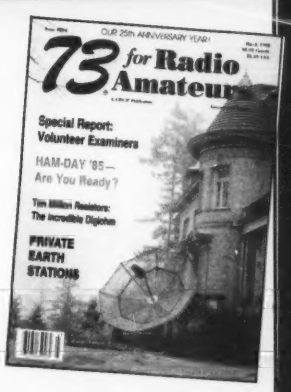
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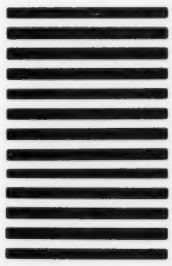
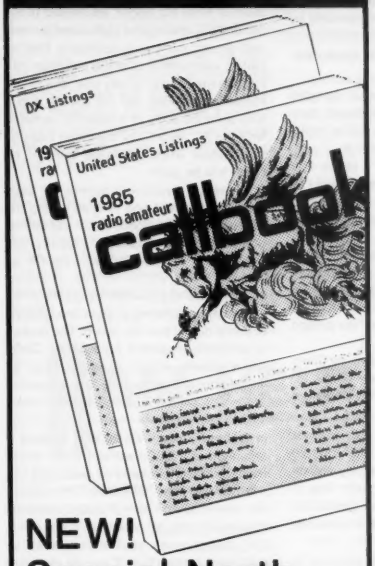


1985 CALLBOOKS



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The U.S. and Foreign Supplements contain all activity for the previous three months including new licenses. Available from the publisher in sets of three (March 1, June 1, and September 1) for only $15.00 per set including shipping. Specify U.S. or Foreign Supplements when ordering. Illinois residents add 6% sales tax. Offer void after November 1, 1985.

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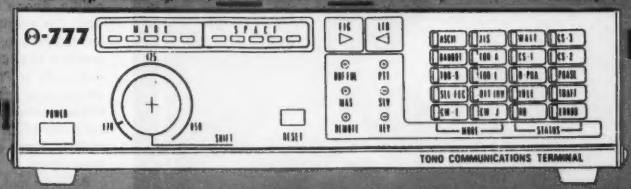

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South American stations and stations in other continents are considered for scoring. A station may only be worked once on each band. Entry classes include single operator, single band or allband, and multi-operator, single transmitter (multiband only).

EXCHANGE:

RST and consecutive QSO number starting with 001.

SCORING:

Each QSO counts 2 points. Contacts between South American stations count only as multipliers, not as QSO points. For South American stations the multiplier is the number of different countries worked on each band. For others, the multiplier is the number of different South American prefixes worked on each band. The final score is the sum of QSO points multiplied by the sum of multipliers.

AWARDS AND ENTRIES:

Certificates will be awarded to the three top-scoring stations in each class and to the top scorer in each country. A separate log for each worked band must be sent no later than Aug 31st to WWSA Contest Committee, PO Box 18003, 20772 Rio de Janeiro, RJ Brazil.

ARRL FIELD DAY
Starts: 1800 UTC June 22
Ends: 2100 UTC June 23

Note that these rules were taken from previous years' contests and no changes were anticipated. This year's rules were not available early enough to make this column, so check *QST* for any last-minute changes.

Sponsored by the ARRL, the contest is open to all amateurs in the ARRL Field Organization plus Yukon and NWT. Foreign stations may be contacted for credit, but are not eligible to compete. The object is to work as many stations as possible under less-than-ideal conditions. Operating times are limited, depending on your operating class; check rules below.

Entry categories are classified by the maximum number of simultaneous transmitted signals, followed by the designation of the nature of the individual or group participation. Below 30 MHz, a transmitter must remain on a particular band for at least 15 minutes once used for a contact on that band. During this 15-minute period, the transmitter is considered to be transmitting a signal (even if it is not) for purposes of determining transmitter class. Switching devices are prohibited.

Class A consists of club and non-club portable stations specifically set up for Field Day. Such stations must be located in places that are not regular station locations and must use no facilities installed for permanent station use nor any structures installed permanently for FD use. Stations must be operated under one callsign and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a 300-meter-diameter circle. All contacts must be made with transmitters and receivers operating independent of commercial mains. Entrants who, for any reason, operate a transmitter or receiver from commercial mains for any contacts will be listed seperately at the end of their class.

Any Class A group whose entry classification is two or more transmitters (non-Novice) may also use one Novice/Technician operating position (Novice bands only) without changing its basic entry classification. This station (including antennas) should be set up and operated by Novice and Technician licensees and should use the callsign of one these operators.

Class B consists of non-club portable stations set up and operated by not more than two licensed amateurs. Other provisions are the same as for Class A.

Class C consists of mobile stations in vehicles capable of operation while in motion and normally operated in this manner, including antenna. This includes maritime and aeronautical mobiles.

Class D consists of stations operating from permanent or licensed station locations using commercial power. This group of stations may only count contacts made with Class A, B, C, or E Field Day groups for points.

Class E stations are the same as Class D except for using emergency power for transmitter and receivers. They can work stations in all classes.

Operators participating in FD may not contact for point credit the FD portable station of a group with which they participate. Any station used to contact one or more FD stations may not be used under any other call during the FD period, except for family stations.

Each phone and each CW segment is considered as a separate band. All voice contacts are equivalent, and RTTY/ASCII is counted as CW. A station may be worked once on each band, and crossband contacts are not allowed. The use of more than one transmitter at the same time in a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. No repeater contacts are allowed.

EXCHANGE:

Stations in any ARRL section send Field Day operating class and ARRL section. A four-transmitter station in NJ would send "4A NJ." Foreign stations send RS(T) and QTH.

SCORING:

Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the FD period, plus bonus points. Phone contacts are one point each, CW counts two points each. Power multipliers are: 5 for using a dc input power of 10 W (20 W PEP) or less (5 W dc output, 10 W PEP output) with a power source other than commercial mains or motor-driven generator; 2 for using a dc input power of 200 W or less on CW and 400 W PEP or less on SSB; 1 for using anything higher.

Batteries may be charged while in use for Class C entries only. For other classes, batteries charged during the FD period must be charged from a power source independent of the commercial mains.

Bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses:

1) *100% Emergency Power*—100 points per transmitter for 100% emergency power. All equipment and facilities at the FD site must be operated from a source independent of the commercial mains.

2) *Public Relations*—100 points for public relations. Publicity must be obtained or a bona fide attempt to obtain publicity must be made, or operation conducted from a public place (such as a shopping center). Evidence must be submitted in the form of a clipping, a memo from a BC/TV station that publicity was given, or a copy of material that was sent to news media for publicity purposes.

3) *Message Origination*—100 points for origination of a message by the club president or other FD leader, addressed to the SM or SEC, stating the club name (or non-club group), number of operators, field location, and number of ARES members participating. The message must be transmitted during the FD period, and a fully-serviced copy of it must be included with the FD report. The message must be in standard ARRL message form or no credit will be given.

4) *Message Reply*—10 points for each message received and relayed during the FD period, up to a maximum of 100 points. Copies of each message, properly serviced, must be included with the FD report.

5) *Satellite QSO*—100 points can be earned by completing at least one QSO via satellite during the FD period. The repeater provision is waived for satellite QSOs and a satellite station does not count as an additional transmitter. Show satellite QSOs as a separate band on the summary sheet.

6) *Natural Power*—FD groups making a minimum of 5 QSOs without using power from commercial mains or petroleum derivatives can earn 100 points. This alternative power source also includes batteries charged by natural means (not dry cells). The natural-power station counts as an additional transmitter. If you do not want to change your entry class, take one of your other transmitters off the air while making the natural-power QSOs. A separate list of natural-power QSOs should be enclosed with your entry.

7) *W1AW Message*—A bonus of 100 points will be earned by copying a special ARRL FD bulletin sent over W1AW on its regularly announced frequencies just before and during FD. This message can be received directly from W1AW or by any relay method. An accurate copy of the received message should be included in your FD report.

REPORTING:

Entries must be postmarked by July 24th; no late entries can be accepted. A complete entry consists of a summary sheet and a list of stations worked on each band/mode during FD, plus bonus proof. The list of stations worked on each band or mode may take the form of official ARRL dupe sheets or an alphanumeric listing of callsigns worked per band and mode. This list may be computer generated. Incomplete or illegible entries will be classified as check logs. A copy of FD logs should be kept by your FD group but should not be sent in unless specifically requested by the ARRL. Normal ARRL disqualification rules apply.

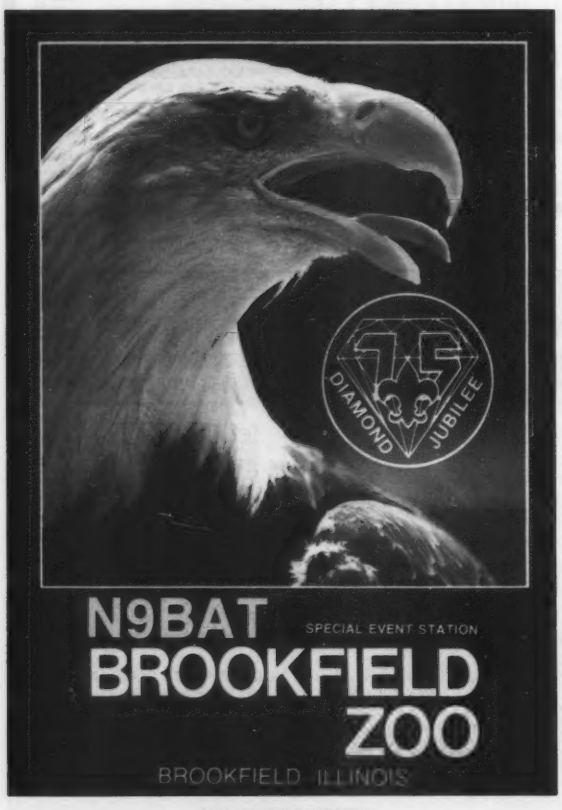
All entries and requests for official forms should be addressed to: ARRL, 225 Main Street, Newington CT 06111. Include a 9" by 12" SAE with 3 oz. postage for a complete Field Day entry package.

SUMMER SMIRK PARTY
Starts: 0000 UTC June 29
Ends: 2400 UTC June 30

Sponsored by the Six-Meter International Radio Klub (SMIRK). No crossband contacts, multi-operators, or partial contacts. Check logs or dupe sheets are not needed.

EXCHANGE:

SMIRK number and ARRL section, for-



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

CONTEST COMMITTEE NEEDS HELP!

The World Championship Contests are growing each year! It is more than our present staff can handle. 1986 is expected to break all records to date. Here's your chance to join the volunteer staff of 73's prestigious contest committee. If you understand contesting, we need YOU! Contact Bill Gosney KE7C, 2665 N. Busby Road, Oak Harbor WA 98277.

eign state, province, prefecture, or country. Count ARRL sections in the 48 US states only; KH6 and KL7 count as countries. Washington DC counts as a section as well. Canadians count as provinces; all others count as states, provinces, prefectures, or countries.

SCORING:

Count 2 points for each SMIRK contact, 1 point for non-SMIRK QSOs. Add QSO points and multiply by number of ARRL sections, foreign states, provinces, prefectures, or countries worked for final score.

AWARDS:

Certificates for high-scoring SMIRK in two divisions: US/Canada and foreign. Certificates for high score in each ARRL section and foreign state, province, prefecture, or country.

ENTRIES:

Entries must be submitted on the Fall, 1981, edition of the official SMIRK log. Single copies are available for an SASE and photocopies may be used. Send log requests and entries postmarked by July 31st to: Mark S. Anderson WB5NPK, 8932 Saddle Trail, San Antonio TX 78255.

HAM HELP

I am trying to find a schematic for a Lafayette model HE-80 receiver. Will purchase or pay all costs for copy.

Norman Murchland
8440 Sheraton Dr.
Miramar FL 33025
(305)-431-2681

In order to resurrect my Centronics 101 printer, I need the following parts: reference number HD6, part number 525130001, part name "Packing," and part number 527363001, part name "Damper." These numbers are from Centronics' technical manual for the Model 101 printer, revision D, dated March, 1975, figure 8-5.

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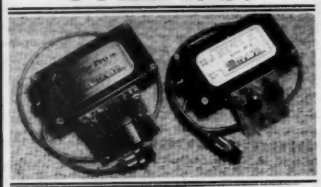

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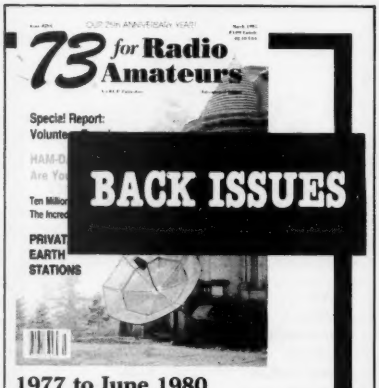

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I convinced my club to buy a repeater controller from ACC and I'm glad I did.

The group I belong to was looking to upgrade our system and I was the one asked to investigate. Of course, we've always been the best in our area but we needed more. We needed a system that was reliable, easy to interface, cost-effective, and something that would free-up the technical committee for more interesting projects than just keeping the equipment running.

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We really use the features like the scheduler, remote programming (from an HT, over the phone, or via a computer terminal), informative voice messages and courtesy tones, telemetry, remote bases, and the most sophisticated autopatch ever designed for amateur use.

Of course, the controller is state-of-the-art, commercial quality, and built to last. Workmanship so solid even the military uses them.

What impressed me even more, though, is the support we get from the staff at ACC — both before and after the sale. And they protect our investment through simple plug-in software upgrades...new features and capabilities that keep our club on top.

I feel good about recommending the Advanced Computer Controls line of repeater controllers. After all, it's *my* club's money that was spent and ***my* reputation that was on the line.**

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LETTERS

FT-301 OWNERS

I have had some trouble with my FT-301. The RX and TX were offset about 130-150 Hz on all bands in all modes, and you can see the problem that will cause if you're on RTTY.

While I don't pretend to take original credit for this modification, I must say I have never seen it in any ham magazine or other publication (unless it pertained to the 101 series).

Apparently, on late production models of the FT-301, Yaesu made a factory modification on the premix unit (PB 1439A) in which TX 13.5 V dc is routed to pin 11 of the board and is used to provide forward bias to D701 via R723. This puts C720 (in an rf voltage divider) across pin 8 of mixer chip Q701.

The result of the application of the TX 13.5 V dc to pin 11 causes enough loading of premix oscillator Q702 to pull the crystal frequency by approximately 150 Hz. This is due to the lower injection voltage in TX only. The problem can be solved by lifting the red wire connected to pin 11 (the RX 13.5 V dc) off pin 11, thus allowing the injection voltage to the mixer to remain constant both in RX and TX. Tape the end of the red wire.

I have noticed no adverse effects in this simple modification, and the RX and TX frequencies are the same. My RTTY problem has been solved.

R. G. Lyon K4FXP
Satellite Beach FL

MAJORITY RULE

I'm not much of a letter writer, but I have heard about all the noise I can stand over the no-code license. The stand taken by the ARRL was a reflection of the views of its members. If people don't like it, then they should join the group and let their feelings be known. If the majority of hams are in favor of the no-code license, then why haven't they made their voice heard? The only way for the hobby to be satisfactory for the majority is for that majority to have a strong collective voice. In the matter of no-code, I think the wishes of the majority have been carried out.

The excuse of needing a no-code license for those who would like to design, build, and otherwise enjoy the many facets of digital electronics is very weak and not valid at all. All this super-fast transfer of information is best carried out over wire line anyway. How many hours of phone time could you use in packet exchanges before you spent the same amount that a rig and antenna would cost?

Your idea of retesting for CW wasn't too bad. That makes more sense than the no-code. After all, there is still CB.

I enjoy your magazine and your ability to make money! I am trying to use some of your tips myself.

Monte "Ron" Stark KU7Y
Nampa ID

IC-71A OWNERS

I have an IC-71A with a problem similar to that mentioned in your review of Stop-Scan in the February, 1985, issue.

The instruction manual claims that the unit stops for 10 seconds then resumes scanning. Mine stopped, but I had to depress Scan to start it again. Figure 7-3, on page 20 of the manual, depicts a scan/stop switch. I suspected that it was set in the wrong position. Well, the 10-second feature showed up after changing the switch's position.

However, two new problems were present. During scanning, the receiver skipped stations, and I suspected that it was due to an excessive scan speed. Referring back to Figure 7-3, I found scan adjuster R14. This pot was fully clockwise. Turning it fully counterclockwise caused the scan to stop. I simply adjusted R14 until the problem went away.

Still, I had the annoying problem of having to push Scan twice to resume scanning. Back inside the rig, I reset the scan/stop switch to its original position. Now, only one depression causes resumption of scanning. And holding Scan down results in continuous scanning. Much better. Frequency stability is better than 100 Hz even after 14 hours, and frequency accuracy is better than 100 Hz, based upon copying an SSB signal for one hour with no discernable change in pitch.

Edward J. Campbell
Yonkers NY

ALL THIS AND MORE

I really enjoyed "All This and PCII!" by Bob Lockwood W4FXI, in the March, 1985, issue. It was a useful application for the portable pocket computer.

Upon entering the program I found that the fixed- and variable-memory functions did not work, but the keyboard-direct mode did work as advertised. One thing led to another, a fix was entered, and with the assistance of WA1SZU and AF1A I decided to add a few additional features.

The program lines in Listing 1 will: increase variable- and fixed-memory space to 80 instead of 16 characters, define "space" to separate words for proper CW timing, speed up the wpm adjustment, add "?" to the CW table (using the period key), and display the characters as they are sent.

These are only our changes—please enter all the other lines as printed in the article. If anyone else comes up with other enhancements, I would be most interested in hearing from them.

Dave Faucher WA1UQC
Collinsville CT

```
1   DIM B$(1)*80: DIM F$(1)*80
4   J=LEN B$(1)
7   A$=MID$(B$(1),C,1)
8   GOTO 13
13  WAIT 0: PRINT LEFT$(B$(1),C)
83  IF A$="." THEN LET A$="112211": GOTO 100
85  IF A$=" " THEN LET A$="0": GOTO 100
109 GOSUB 137
116 IF C<J THEN 6
120 F$(1)="": INPUT F$(1)
124 B$(1)="": B$(1)=F$(1): GOTO 4
126 B$(1)="": B$(1)="DE URCALL": GOTO 4
128 B$(1)="": B$(1)="UR RST IS": GOTO 4
130 B$(1)="": B$(1)="UR QTH": GOTO 4
132 B$(1)="": B$(1)="UR NAME": GOTO 4
134 BEEP 1,28,90: RETURN
136 BEEP 1,28,300: RETURN
137 WAIT 0: RETURN
```

Listing 1. Enhancements to Lockwood's "All This and PCII!" in March, 1985.

WHY SHOOT J. R.?

In response to the letter from J. R. Russell in the March, 1985, issue: While crossbanding is legal under current FCC rules, it is a very sleazy practice. It takes up 40–50 kHz of spectrum that could be available to other amateurs. I've been caught calling CQ on a DX operator's "window" and can testify to how rude these DX operators can be.

Al Winters WA6FFV
Richmond CA

The whine of J. R. Russell KA0FCM in your March, 1985, issue that foreign operators dare to use "Novice" bands for anything other than CW prompts this reply:

You, sir, are typical of a growing number of inconsiderate (*deleted*) who believe the sun rises and sets according to the American practice and who blissfully ignore the rest of the world.

You, I suppose, are one of the American CW operators who consistently interfere with public-service phone nets operating between 3775 and 3725 kHz in Canada and ignore all requests to QSY. Or are you one of those boors who has decided that if you can't operate phone below 7100 kHz, then those damn foreigners can't either?

For goodness sake, sir, get a *Callbook*. Or a copy of the ARRL logbook. Or *The ARRL Handbook*. Any of them will contain a list of prefixes and/or band plans. And listen. Listen *a lot*. You may even discover that there are operators *beyond* the boundaries of the United States!

The United States has given the world many wonderful things and has some of the nicest, most considerate, and competent radio operators in existence. Unfortunately, it has also given us Citizens Band radio and J. R. Russell KA0FCM.

Robert Smits VE7EMD
Surrey BC

Seems we've really struck a nerve here! Both of you, though, have missed the point.

Al—The operation was split-frequency, not crossband, and occupied at most an extra 3 kHz, assuming both stations were using SSB. As for DX "windows," there are countries where these slices of spectrum are the only spots available for use. A gentleman will avoid treading upon them out of goodwill.

Robert—Your criticisms are valid, but to focus them all on a single Novice is hardly fair. Remember when you were a beginner?—Ed.

WHAT PRICE QSL?

To Amateur Radio Station H44IA
Honiara, Solomon Islands

I recently sent you a QSL card for a contact we had on 40-meter CW, February 18th at 1210Z. I enclosed a self-addressed, stamped envelope with Solomon Island postage to be used to return your card to me.

Today, I received my envelope back in the mail. Instead of the expected H44IA card, you had returned my card with a note: SORRY BUT 50¢ STAMP DOES NOT HELP TO RUN THIS END.

The 50¢ stamp was not intended to help "run" your end. It was intended to pay the postage for your card back to me. The postage was adequate since you used my SASE to return my card to me. If you can't afford the hobby, you shouldn't be in it. The 50¢ Solomon Island stamp cost me more than $1.00 here and was simply a goodwill gesture to defray your expense for sending a QSL card to me.

I think you are a disgrace to amateur radio, since you are obviously trying to *sell* QSL cards. I believe this is your home station, not even a DXpedition operation, so even a request for a donation would be out of place.

I do not feel that your station should be accredited to count for any of the DX awards. I think it should be categorized the same as a station with invalid credentials. I will send a copy of this letter along with copies of my return envelope and both sides of my returned QSL card to all of the major organizations who sponsor DX awards and DX contests. In addition, I will send a copy to the agency that licenses amateurs in the Solomon Islands. In the US an amateur station is not to be used for monetary gain, in *any* way.

Warren Ash AK2H
Kingston NY

BLOOMING

Once in a while there comes along a writer able to clearly and concisely express himself to the reader, one who obviously knows his subject, and one who wastes no words when writing. Such an author is Robert Bloom W6YUY. Congratulations to the author for the writing and to the Editor for publishing "Swr: A Modern Myth?" in the February, 1985, issue.

How about having W6YUY write on amateur applications for varying the height of antennas with telescoping towers to accommodate operational wavelength and antenna height above effective ground? Shouldn't this increase effective radiated power without more Watts input? What are the techniques for "tuning" the antenna height?

Or, how about a discussion and explanation of the use of a variable-length dipole? Didn't the military at one time use a 2-reel steel tape at the center of a dipole to provide wavelength selection? There must be a way, within amateur limits, to successfully vary a dipole's length.

Claude Holmes WS4D
Coral Gables FL

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I need the schematic and manual for a Corbin-Farnsworth Scopette model SCPT-4, circa 1960. The clicker accessory schematic would also be helpful. The SCPT-4 is a piece of medical electronic equipment showing EKG and EEG tracings on a slow-decay phosphor scope. Copies and postage paid.

Ronald Young WB2JJX
36 Brompton Rd.
Garden City NY 11530

I need an owners/service manual for a Regency HR-212 2-meter transceiver. I will reimburse copying costs or will photocopy and return the original.

James Lee WB4GWX
5004 Ridge View Court
Fort Worth TX 76118

I need information on a Dynamic Communications, Inc., 2-meter amplifier, model 101-500D.

Stephen L. Ford N4LNB
Rt. 1, Box 7
Bristol FL 32321

I need schematic and alignment instructions for a Hammarlund model HQ-105TR or HQ-100, which I think is the HQ-105TR without the CB transmitter. I will pay the cost of copying and postage. Also, I need schematics for an RCA WO-88A oscilloscope and a Hickock model 6000A tube tester.

Paul Van Nostrand W4HVD
3725 Lifford Circle
Tallahassee FL 32308

Does anyone have drawings of the coil winder I have heard the old-timers talk about?

Bill Boyer KA5UBK
Route 4, Box 1078
Hattiesburg MS 39401

I am in need of parts for the Collins R-390A receiver. I especially need two coils (T-501 and Z-503) on the I-f subchassis (the powdered iron tuning slugs in these two coils are cracked). I would appreciate any help in obtaining these parts.

Robert L. Wood WA7DNN
PO Box 9474
Dededo, Guam 96912

I need the schematic, board layout, and alignment data for a Bearcat 101 scanner. Copies from Sam's SD-10 would help. I will reimburse copying costs.

Lisle T. Hines K2QLA
11 Meadow Drive
Homer NY 13077

I have acquired a tube-type model 100 VTVM made by Electronics Design, Inc., of Irvington On Hudson, New York.

I need a service manual, which I will pay for.

George H. Gaul K4FCJ
4904 92nd St. W. Coral Blvd.
Bradenton FL 33507

I need technical or consumer information on a tube-type National radio, model no. HRO-50R, which I am trying to equip with a bfo for single-sideband reception. Any information will be appreciated.

Angelo Anello
PO Box 15926
Tampa FL 33684

I will pay for copies of the manual and/or schematics for a Central Electronics rf analyzer, model MM-1.

A. L. Marsden WN6AOH
449 North Concourse Avenue
Montebello CA 90640

I am looking for a schematic and service info for the Unimetrics SEA-COM 55 VHF FM marine transceiver. Has anyone converted the rig to 2-meter FM? I will pay copying and postage expenses.

Frank Burkholder K8QBM
702 N. Bryan
Okmulgee OK 74447

I need manuals for an Eico model 147 signal tracer and a Johnson Viking phone patch. I will pay reasonable costs incurred.

Bill Fritsche K8SDZ
1512 W. California
St. Paul MN 55108

I need a 4-section electrolytic can capacitor, 20-20-20-30 μF, 650 volts.

Charles Schramm KA2JLC
28-28 35th Street
Long Island City NY 11103

Gertsch FM-9 Service Monitor schematic and/or repair manual needed. Will gladly pay all expenses.

Jim Turgetto WB6ZRO
454 East Cypress Street
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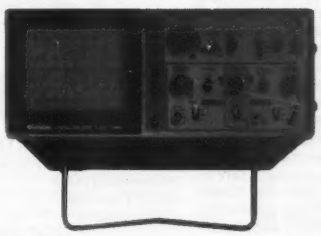

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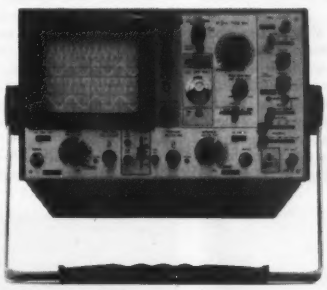

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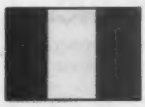
73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73 Magazine, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KW1O.*



BELGIUM

Michel Bouchez ON6XN
Residence des Agaces 40
7310 Jemappes
Belgium

As I never saw anything from Belgium in "73 International," I take up my pen and hope that you'll be interested by some news from here.

We are about 4,500 hams in Belgium, with about 50% of us active. Calls are designated as follows:

ON0—repeaters
ON1—only VHF and up (non-code exam)
ON4 to ON7—all over the bands
ON8—for foreign hams in HF and VHF
ON9—for foreign only VHF and up

The calls issued were in the form: ON + one number + two letters, but for 2 or 3 years the post office has issued: ON + one number + three letters with the first one from A to J for Flemish hams and K to T for French hams; the old calls are still in use.

There are 3 grades of license, but the call doesn't reflect the grade as in USA. These are class A for input power limited up to 125 W, B1 limited to 250 W in HF and 125 W in VHF, B2 limited to 250 W in both HF and VHF, and C limited to 500 W.

There are a lot of club stations all over the country, but they don't have special calls. These associations receive calls like personal ones. To receive a call, a club must be sponsored by 2 licensed hams who have to guarantee respect of the law. Only licensed hams may work on the station.

There is an official QSL Bureau in Belgium recognized by IARU: It is UBA (Union Belge des Amateurs). On the side there are some small dissident associations which practice what I call a war of QSL cards. Men or women who are not affiliated with one or another association don't receive the QSLs... it is really a pity.

CYPRUS

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Limassol
Cyprus

DX INTERNATIONAL

We were informed recently that ZC4s from the British military bases were given separate DXCC status by the ARRL. There are about a dozen ZC4 stations on the island, and it seems that they are in great demand right now; we get a lot of queries from foreign amateurs about their frequencies and times of operation. I, personally, have a regular sked with ZC4AB, ZC4HA, ZC4JE, and 5B4DN (who is also ZC4AM) on 28.500 MHz at 1800 UTC every Monday, Wednesday, and Saturday. Andy ZC4HA told me that he is usually QRV in CW on 10.103 MHz at night. Alan ZC4AB has no regular times but he is operating usually on 14.275, 21.275, 28.500, and 3.795 MHz. Alan has an excellent V-beam which is directed towards Europe and North America.

ZC4AM (who is also Andy 5B4DN) is operating during the afternoons and evenings when there is propagation on 10, 15, and 20m. Look for him around 14.223. On Saturdays during the daytime he is operating portable from the Salt Lake of Akrotiri with a 4-element half-yagi beam stuck into the soil of the lake with excellent results. Another very active ZC4 is OM Martin ZC4MR, who is operating from the other base (Dhekelia) on the southeast part of the island. I heard him many times on 20m.

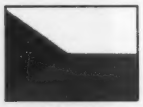
On the 6th and 7th of April, the ZC4s had an activity Easter weekend, operating on all bands for the whole 48-hour period. This was a very good chance for DXers to work the ZC4s.

Now on the 5B4 side, there is good activity on 20m and much less on the other bands. Regulars on 15m and 20m are 5B4OO, 5B4IS, 5B4OP, 5B4IR, 5B4OK, 5B4JE, and 5B4JR. On 40m we have 5B4OK, 5B4JR, 5B4JX, and 5B4JE. On 75m I am QRV most evenings around 2100 to 2200 UTC on 3.795 MHz despite the fact that my FL-2100 B has faulty bandswitch contacts and is not working on 75m. I hope to get a replacement soon from Japan and perhaps my station will be heard a little better.

On 1.8 MHz there is no activity at the moment. On the RTTY mode, 5B4OP, 5B4MD, 5B4MC, 5B4IT, 5B4LP, 5B4HF, and 5B4CV are quite active.

On SSTV, 5B4CV can be found on 14.230 MHz. 5B4JE has receive facilities at the moment but soon he hopes to be on the air on this mode with the assistance of his harmonic, George 5B4OV.

An interesting amateur from Limassol is Andy 5B4IR, who is also the QSL incoming manager of CARS. Andy is an electronics engineer, quite active on the bands, and a good constructor. He is brewing an HF linear at the moment, and together with his FT-902 DM and 3-element tribander is going to be heard for sure.



CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Komenskeho 1477/8
955 01 Topolcany
Czechoslovakia

CHAMPIONSHIP

September 3 to 12, 1984, the Second World Championship in the Radio Orientation Race was held in Kaero, Norway. The representatives from Czechoslovakia gained great success. They won 10 medals: 2 gold, 2 silver, and 6 bronze ones. Eight runners with their coach, Popelik OK1DTW, took part in the championship.

A MODERN RACE

An international contest took place in the capital of the Korean Peoples' Republic in August, 1984. It was held under unusual and almost tropical meteorological conditions. 105 competitors from 6 states participated in it. After four difficult nominating contests, there were 12 competitors chosen with their coach Pazourek OK2BEW and their referee Mikeska OK2BFN. In the race the competitors compete in four events: the reception of telegraphic callsigns, the transmission of callsigns, the operation of the station (1 Watt output), and the orientation race.

EUROPEAN RECORDS

On July 5, 1984, the present European record "Tropo" was broken by propagating in the 433-MHz band, contacting the station GW8VHI in locator YL 32f and the station EA8XS in locator SO 73d. The distance overcome was 2772 kilometers. GW8VHI was using TS-77OE and PA with the input of 50 Watts and a 19-element yagi. QTH is 50 meters above sea level. The station, EA8XS, was working at the mentioned time with: G8ZDS, G4WIQ, EI9Q, and GW8ELR.

DXPEDITIONS:

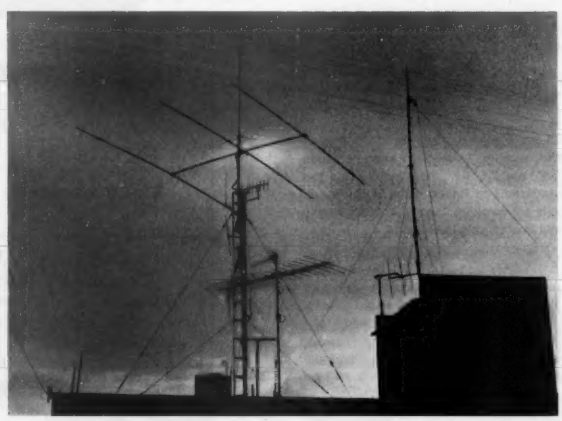
In the second half of August, 1984, the first expedition was working in the 1296-MHz band propagating "Earth Moon Earth." It was put into operation by HB9MZQ and OE9PMJ. They were working in Lichtenstein under the callsign HB0BM/P and were using a parabolic antenna. The transmitter used TH-328s for an output of 600 Watts. They were listening to the sun noise at a 13-dB level and made 15 complete contacts with 12 stations in France, Great Britain, Luxembourg, The Netherlands, Czechoslovakia, Sweden, Canada, Australia, and the USA. Radioclub OK1KIR from Prague in Czechoslovakia also made some contacts.

AMSAT-OSCAR 10

OK1BMW and OK1DR had joined their forces and deciphered RTTY transmissions at the GB AO-10 B beacon in the 145.810 MHz band by an "off line" method.

Karel OK1BMW arranged the reception of signals and their recording on tape. It was also necessary to tune up the receiver in such a way so that the tones from the beat-frequency oscillator (bfo) might match those of the low-frequency filter of the teleprinter converter (1275 and 1445 Hz). The oscilloscope attached to the receiver output served for tuning. The frequency of 1275 Hz from the tone generator controlled by a digital counter was brought to the horizontal amplifier of the oscilloscope. The receiver was tuned up in such a way that at the sign signal, on the

Andy 5B4IR in his shack.



Andy's antennas.

screen an ellipse (Lissayous pattern for the frequency 1:1) appeared. Some hours later Jirka OK1DR, at his teleprinter system with a screen, could read the news from the tape and from memory; he typed with a teleprinter.

DXCC IN CZECHOSLOVAKIA—TOP FIVE STATIONS, (TO 10 OCTOBER, 1984)

CW/Phone		OK1TA	294/300
OK1ADM	315/346	OK1MP	294/297
OK3MM	314/354	OK1MG	290/294
OK1MP	314/345	**Phone:**	
OK2RZ	313/333	OK1ADM	314/340
OK1TA	312/332	OK1MP	312/328
OK3EY	289/293	OK1TA	309/324
CW:		OK2RZ	308/324
OK3JW	296/300	OK2JS	307/317

DOMINICAN REPUBLIC

M. F. Pimentel HI8MFP
Box 2191
Santo Domingo
Dominican Republic, W.I.

Confusion of the name of our country, Dominican Republic, with the island of Dominica is the cause that contributes the most to the loss of correspondence or the QSL cards of HI.

Dominican Republic (HI) is the country that shares the Espanola island with Haiti (HH). This island, of approximately 76,192 km^2, belongs to the Major Antilles and is located in the Caribbean Sea between Cuba and Puerto Rico.

In the same Caribbean Sea and as part of the Minor Antilles is the Commonwealth of Dominica (J7, VP2D), with an area of 751 km^2. The volume of correspondence that is misled to Dominica, whether addressed right or wrong, is unbelievable.

To avoid this confusion, it is very important to write on the envelope with clear block letters, "Dominican Republic." On other occasions, QSLs and other kinds of correspondence do not have the address clearly written and this, added to a faulty mail system, makes it impossible at times to receive answers and confirmations.

Some days ago, I received a note from a North American ham in which he asked me to help him find a confirmation. The address he had written was "San Pedro Marco" when the correct name of the city is "San Pedro de Marcoris." Another, from New York, wrote underneath the PO Box number: "Santo Domingo, Haiti." Hardly ever does correspondence reach the intended destination if wrong addresses are used—particularly those that are long and complicated. It is better to use PO Box numbers or the QSL Bureau. But—is the Bureau effective?

On certain occasions it is very effective, but sometimes, no! A QSL arrives at the HI Bureau and is processed. If the addressee is up-to-date with his payments, he will rapidly find the QSL in his booth. The QSLs of those with accounts that are past due end up in a common box.

But also to be taken into consideration is that not everyone visits the QSL Bureau regularly to withdraw the correspondence; as a matter of fact, some do not go at all for a long time.

If the contacts are of HI1, 2, 3, or 8, it is effective to use the Bureau or the PO Box number of the station worked. If they are of areas such as 4, 5, 6, 7, and 9, then it is better to send them directly with the address clearly written, keeping in mind the need to always print at the end: DOMINICAN REPUBLIC (or REPUBLICA DOMINICANA) and *not* Dominica or Republic of Dominica.

NEW PREFIX

Since the past 3rd of October, commemorating the second visit of Pope Juan Pablo II to the Dominican Republic, a new prefix is on the air. The first stations to receive the new prefix were: HI9DX, HI9MF, and HI9MFP; among others that were later on the air were HI9B and HI9C.

The new prefix will be in force until the next month of March. The QSL address for HI9DX, HI9MF, and HI9MFP is PO Box 2191, Santo Domingo, Dominican Republic. For HI9B and HI9C the address is PO Box 1157 of the Radio Club Dominicano.

NEW BOARD OF DIRECTORS

A new Board of Directors was recently elected for Radio Club Dominicano, presided over by Rosario de Morales HI8RPD, wife of Otto Morales HI8OM, past president of the organization. It is the first time that a woman has been president of the RCD, and she is accompanied by the following: William Read HI8WRE, Vice-President; Otto Morales HI8OM, Secretary; and Victor Taveras HI8VAT, Cesar Desargles HI8CQ, Joe Lomba HI8LE, Abed Nego Montalvo HI8IH, Julio Felix HI9JOF, and Jorge Genao HI9JLG.

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire
England

THE UK SCENE

I can remember in my award-hunting years the difficulty of obtaining details of some overseas awards. One would often see a brief mention in the likes of *73* which was sufficient to whet one's appetite, but insufficient to make an application. Thus followed the double frustration of seeking full details and then waiting for the certificate to arrive.

This particular problem will not exist for the majority of *73* readers (i.e., those living in the US) who are interested in the Worked All Britain (WAB) awards. As well as the Award Manager, G4KSQ (Brian Morris, 22 Burdell Ave., Headington, Oxford OX3 8ED, England), there is a US contact point. Dave Bird AA6DB of 11226 Quinn St., Downey CA 90241, will send a detailed WAB information sheet in return for a stamped and self-addressed envelope.

That such an information sheet is necessary is without doubt when I look at the basis of WAB. The basic award (WAB areas) and the non-UK option (WAB Overseas Introductory Award) both require the award hunter to collect contacts in different map squares. The particular squares are those based on a 10-km × 10-km grid on UK Ordnance Survey (OS) maps. OS maps are the standard by which all maps are judged in the UK and are produced by a quasi-governmental body. However, the 10-km squares are unlikely to be found on maps of the UK available elsewhere (and, if so, are highly unlikely to be numbered in the OS style).

A special record book is available from the award sponsors for $10.00 and can be used to keep track of squares collected. If that's too confusing then try the WAB Counties Award which requires the collection of UK counties only (more like US states than counties). Once again, Dave Bird has the details.

Having extolled the virtues of a local manager for UK awards, I am forced to admit that I do not currently have such for the Cheshire Award which I look after. Any offers?

I have briefly explained, in earlier columns, differences between UK licenses. Class A license holders can use all bands whereas Class B can use only 144 MHz and above. The only difference in qualifications is that Class A holders have passed a Morse-code test. So anyone wishing to upgrade from Class B (written examination only) to Class A must learn Morse code.

Unfortunately this has, to date, been an activity confined to the aspirant's house. Class B licenses have not permitted the holder to use Morse even on VHF bands. They could, of course, listen to Morse anywhere for the purpose of practice, but could not transmit.

On April 1st of this year, the Department of Trade and Industry (the DTI—the UK regulatory body) changed this for an experimental period of twelve months. Class B license holders who wish to take advantage of this must request permission in writing and will be given a temporary "license variation." Anyone requesting a variation will be given one. The only direct implication of this for US stations is the potential for more Morse traffic on OSCAR or EME (Class B license holders are not permitted on 50 MHz).

You might, therefore, be able to work a G8 or G6 station on CW. The long-term implication should be more Class A license holders. Any action that promotes amateur radio in this way is to be applauded.

My globetrotting continues (this is being written aboard a Swissair flight to Zurich!) and I am likely to be in New York every five or six weeks. If any reader would like the opportunity to buy me a beer, please write and provide a phone number.

On columns will be considered on an every-other-month basis. Of course this is fine with me, but it will compress all kinds of information in a new "packed form." I hope the readers will soon be familiarized with it.

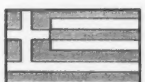
A couple of weeks ago, we had the annual "Cut of the Pie," and taking this opportunity, our union officials honored three of my fellow amateurs for their contribution to amateur radio. The first of them, George SV1AA, is one of those pioneers who for about 50 years now has been supporting all radio activities in this country. The other two, George SV1AB and Costas SV1DH, were honored for a common effort concerning transequatorial propagation. Costas, whose article in *QST* was elected "The Article of the Year" for 1981, has spent many, many hours experimenting and recording the results of his experiments with ZE2JV in Zimbabwe and ZS6PW in South Africa, the stations on the other end of the line.

More on Costas and his experiments in a future column where he will be presented properly.

Finally, I would like also to mention an announcement which was made during this small celebration about an amount of money which was given by the Greek government to our union in order to equip our headquarters. This happened for the first time in our history, and I wish and hope this to be the beginning of a fine cooperation.

One more brief news item: Concerning satellite activity, SV1OE took second place in a contest carried out on AMSAT's AO-10 satellite for a period of three months.

Closing for this month, I note that two Big Guns are coming into Greece for a 160m DXpedition: Bill K1MM and Jim K1MEM should be on by now from the island of Rhodes; more on this and perhaps some photos in my next column.



GREECE

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Athens 11210
Greece

At the inception of this column, participating countries were few. Today there are many more, and recently I received a note from the magazine saying that from now

MALAYSIA

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Malaysia

SEANET CONVENTION

The SEANET (Southeast Asia Net) can be heard daily at 1200 UTC, frequency

Speakers at the Symposium (from left): Ebbey 9V1QG, D. D. Devan 9M2DD, Mayuree HS1YL, Hassan V85HG, speaker from Indonesia, and Klaus DK9VC/DU2. (Photo by 9M6MO)

14.320 MHz. This net was started by a few hams in Southeast Asia. It has grown so large that there are checks in from all over the world. Devoted net controllers work out the schedule among themselves, running the net day after day. These controllers pass DX news and emergency or medical traffic, assigning frequencies to stations who wish to contact each other. The desire for net members to have eyeball contact brought about the first convention in 1971, and ever since it has been held annually.

The 14th SEANET Convention was held on the 16th, 17th, and 18th of November, 1984, in Penang Island, Malaysia. One hundred twenty-eight delegates from the Southeast Asian region and also from Japan, Australia, India, and the US attended this convention. Among them there were also beautiful YLs and XYLs. For some of them this was their first time meeting each other. It is amusing to imagine how a person looks like behind a voice and then when you meet him in person to find that your guess was wrong.

Among other interesting things were technical presentations on digital communication, OSCAR 10, and also AMTOR mailbox. During the evening, participants sat and relaxed at the banquet, watching cultural dances presented. Some of the delegates themselves presented their traditional dances, songs, or music.

During the symposium, net members were given the opportunity to voice their suggestions on how to improve the net. Net members were concerned over the growing interference (QRM), especially during net time. The symposium also discussed which country should host the next convention. It was later decided that either Brunei (V85) or the Philippines (DU) will be the host.

Delegates were conducted on a short tour around the Penang Island. Those who were new to the island were able to see many historical and interesting places. For others, who had been here before, this visit brought back some good memories of the past. Among the tourist attractions visited was the snake temple. Visitors can have photographs taken with these snakes coiled around their bodies.

Penang is one of the 13 states of Malaysia. It is situated on the northwestern coast of the peninsula. It consists of the island and a coastal strip on the mainland called Province Wellesley. The island has an area of 285 square km, and Province Wellesley has 759 square km. They are separated by a channel 3 km wide at the closest point. The island and the mainland are linked by a ferry service which operates 'round the clock. A bridge is now being constructed to link up these two places.

PHILIPPINES

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Hello again, everyone. By the time you read this article, I will have gone back to DU-land, just in time for the holiday season.

I was surprised to receive a letter from an old-timer who read my last article and is very interested in going back to the hobby with another old-timer friend who was a former DU ham. They are interested in QSOing with DU hams but are unable to hear any. Since we are currently on the low end of the current sunspot cycle, propagation towards DU-land on 20 meters and 15 meters has not been all that spectacular, although openings on these bands on the west coast have been around 2300Z. One can find Dr. Alex Legarda DU1AL on 14.285 MHz plus or minus QRM (this is the frequency of the informal Mabuhay net which normally meets at 1500Z) or the ever-active Robin DU9RG who is located in the southernmost tip of the Philippines. He normally hangs around 14.230 to 14.170 MHz. There are a dozen class 8s also using the new DV prefix who are active on 15 meters CW and SSB at about 2200 to 2400Z.

Well, as promised in the last article, I will finish the history of amateur radio in the Philippines from WWII to the late sixties.

Most Filipinos heard of the Japanese surprise attack at Pearl Harbor on their radio sets at home. Little did they know that about an hour later they would also be under attack, by another Japanese naval task force. Needless to say, all amateur-radio operations ceased after the invasion. The bands were soon occupied by coded military signals. After the Japanese occupied Manila, all amateur-radio equipment had to be turned in to the Japanese Signal Corps, but some old-timers had told me that they had "saved" enough radio parts to build SW converters for their BC radios and were able to hear broadcasts from station KGEI on 6 MHz. This was their only means of news information other than the Japanese propaganda news on the local radio.

Other local hams also did not lie idle; all of them joined the local resistance and were commissioned to build transmitters and receivers from spare parts stolen from the Japanese. One of these stations was the famous WPM who was shown in the movie "American Guerillas in the Philippines," which starred Tyrone Power. It was shown contacting station KFS in San Francisco—which later became a War Department relay station for the Far East. It was station WPM which later contacted General MacArthur's headquarters in Australia. This was the beginning of the Australia-to-Philippines "connection." At the early stage of the occupation this was the only radio communication station between the headquarters of General MacArthur and the guerilla forces in the Philippines. So amateur radio played an important part in the war effort.

From 1945 to 1946, the postwar era, came a period of transition and adjustment which came about due to the change of the political status of the Philippines from an American colony to an independent nation. It was in this period of transition that an ugly turn of events in Philippine amateur radio came about. As in all parts of the world, postwar meant postwar surplus.

Surplus communication equipment was abundant in Manila and was sold on a big scale, and many sets fell into the hands of unauthorized persons, commercial companies without licenses, and even insurgents who were planning to overthrow the infant Republic. As a reaction to this, the government tightened amateur operations by forbidding third-party communication and DX. DXing was allowed only with the United States and its possessions in Asia and Oceania.

This restriction did the most damage to amateur radio in this country and was not lifted until 1959. Volt Sotto DU7SV was one of the most active hams in the country during this period. His now famous QSL card was one of the most treasured cards from this part of the world.

In 1949, the ITU granted the Philippines the DU prefix. Prior to this date many Americans still transmitted from the Philippines. Not until 1949, after the official prefix change, did the Americans actually refrain (of course with a few exceptions) from transmitting from this country. It took till 1977 before Americans could start transmitting again due to the signing of a reciprocal agreement between the two countries.

In the summer of 1959, which coincided with the Boy Scout World Jamboree being held in the country, a major event occurred. During the opening of the Jamboree's amateur-radio station, DU1PAR, the chairman of the Radio Control Board finally granted the ham-radio population the DX privilege to communicate with the countries that sent delegates to the Jamboree. This ended 13 years of restrictive DXing for the local amateurs.

In the sixties, a DXpedition to The Rock (Corregidor) was memorable because it marked the first time since 1949 that American amateurs under the sponsorship of the Philippine Amateur Radio Association were allowed to operate the station in the DXpedition with the new prefix DU0DM. The new prefix attracted DXers, and in the 45 hours of operation in this tiny island bastion, about 300 QSOs and 46 countries were logged.

Well, there it is, a condensed history of amateur radio in the Philippines. Don't forget, if you are passing by the country for a visit or some kind of stopover (even if only at the airport terminal), the PARA repeater frequency is at 144.74, and minus 600 kHz transmit. If you are passing by Clark Air Force Base, the Central Luzon Amateur Radio Club frequency is at 145.70 and there is always somebody monitoring the frequency. So until next time, good DX and good luck.

POLAND

Jerzy Szymczak
78-200 Blalogard
Buczka 2/3
Poland

Communication Publishers has issued the second updated edition of the *Radio Amateur's Handbook*. The work is a useful technical aid for hams, technical school students, and professionals. It reflects the state of radio-amateur techniques in Poland.

In an introductory part of the book, Eng. Andrzej Mickiewicz presents a ham's workshop. Discussing the main stages of radio construction, he acquaints readers with materials and subassemblies, talks over PCBs, coil winding, soldering, and assembly. In subsequent parts of the guide, Eng. Jerzy Kozminski deals with passive or RLC elements, their computations, marking, and technical data.

Different tanks are the subject of a chapter by itself, like wave filters: ladder-types, low-pass, high-pass, RC, and crystal filters. As usual in this book, basic characteristics of available materials are tabulated. Radio noise, disturbance, and ways to stand out against them with suppressor capacitors (of Bosch), coils, and radio interference eliminators (miniatures of Sprague) are mentioned. Diodes, transistors, and some ICs hams attach great importance to are introduced with tabulated parameters and encapsulation drawings.

In the chapter entitled "Basic Circuits," written by Engs. Henryk Chacinski and Andrzej Lobzowski, radio fans find basic theoretical and practical information about different amplifiers, detectors, feeders, and generators. Part and parcel of the modern technique: logics, gates (NOR, NAND, and others), triggers, and counters help to modernize very classical equipment. Basic measuring instruments and their application to radio circuits are presented by Eng. Zbigniew Szpakowski.

Wireless receiving installations, their subassemblies, remote control, and digital readouts of frequency, panoramic attachments to them, are proficiently described by Engs. Cezary Rudnicki and Leon Kossobudzki.

The largest chapter, "Wireless Transmitting Installations," contains a description of various modulations including SSB, transmitting tubes with their calculations, and other structural members. The author, Eng. Ryszard Janulis, gives some examples of calculation of transistorized line amplifiers for amateur bands 80–0.7, designs of filters for a rectifier of anode voltage, and general ideas of transmitter design. The measurement of SSB signals with an oscilloscope, and harmonics complete the section.

Antennas and propagation are subjects of a chapter authored by Eng. Stanislaw Krolikowski.

More and more popular are remotely-controlled radios, their systems of control, receivers, transmitters, and their operation. They are comprehensively depicted in the 13th chapter by Eng. Andrzej Chmielewski. The last section deals with feed systems. Eng. Zbigniew Szpakowski presents rectifiers, filters, and constant-voltage regulators.

This very useful compendium of radio-amateur knowledge consists of over 1100 pages and many diagrams. No doubt it makes a big contribution to the development of the Polish radio-amateur's service. The printing of 80,000 copies has been sold out.

PORTUGAL

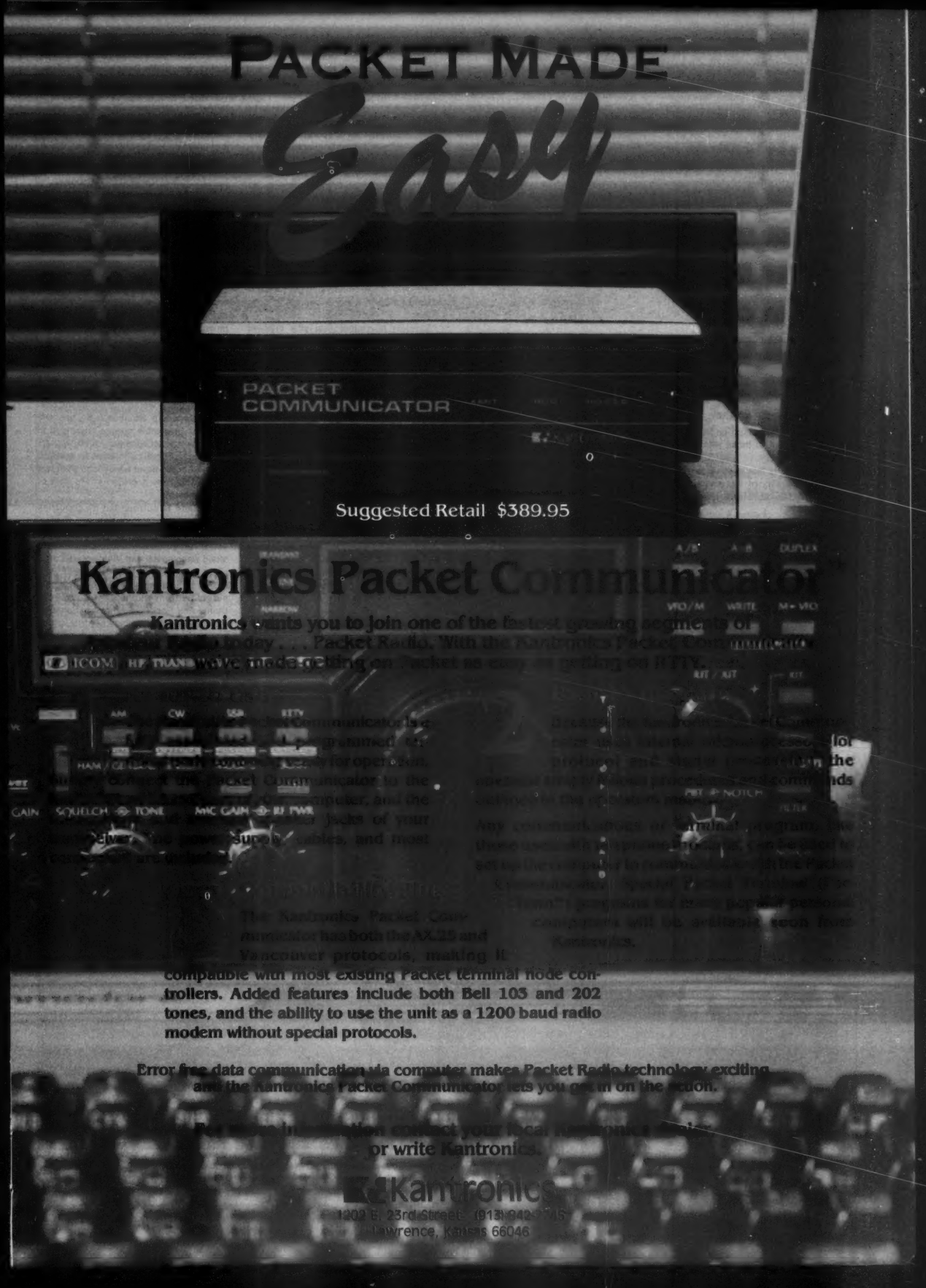
Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril 2765
Portugal

In my last column in this appreciated magazine, I wrote a few notes concerning all the associations and club stations registered in this country. Requesting more information from them, I just received the first report of ARSUL (Associacao de Radioamadores Do Sul), situated in the city of Portimao, southern Portugal.

This place is very well known in the tourism world for the lovely seafood, nice beaches, and the good hospitality of the people, known as "Algarvios." The association was founded March 2, 1982.

According to ARSUL's constitution, the club is for all those who dedicate their efforts to wireless activity and other studies in the electronics field.

ARSUL issues *QSL*, a bulletin sent to all members. In this publication, several matters are discussed such as awards, contests, local news, and small electronic projects—some of them very useful for the hams. In the last issue, we are helped to build the following projects: an antenna coupler for 144/146 MHz, a vfo for 2m, a vertical antenna for 10/15/20 meters, and a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simple but effective semiconductor checker for the bench.

Last November, a contest took place to celebrate the "Feira de Portimao" (Exhibition of Portimao). The contest was organized by this association, and they had a big success, for many Portuguese and Spaniards were enthusiastic for this event. We had CTs, EAs, and EA8s from the Canary Islands.

Here are the point totals for some top scorers:

HF	
CT1BSC	678
EA1CMY	646
EA1CMX	646
CT1CDL	642
CT1YJR	629
VHF	
CT1BSU	128
CT1ASY	118
CT1CPR	99
CT1FQ	97

The boys in ARSUL have a department of software for the users of the ZX Spectrum, Sinclair ZX81, and TS-1000 microcomputers.

ARSUL CW AWARD

The CW operators might be interested in this award, sent to those who accomplished the following:

(1) The award is issued to commemorate the anniversary of this association, and the QSOs should be made after March 2 of 1985.

(2) The ARSUL CW Award is available to all licensed radio amateurs and SWLs (allband CW only) who have worked 10 (ten) different CT stations and the ARSUL club station, CT1ARS.

(3) For applying, send a log, copies of QSL cards, and 6 IRCs to ARSUL, PO Box 50, Portimao 8501 Portugal.

IATC NET

This stands for International Air Traffic Control Net. It is rather interesting and is the right place to find people involved in aviation (airline pilots, aircraft engineers, air traffic controllers, balloonists, etc.). I'm sure you all remember the first solo transatlantic balloon flight made by Joe Kittinger, Jr. N4HDP in the *Rosie O'Grady's Balloon of Peace*, in September of 1984, from Caribou, Maine, to Montenotte, Italy. Joe is a member of our net, too. So, if you have any interest in aviation, or even being a good (non-scared) passenger, join us in the future. We meet daily at 1000 UTC on 14,277 kHz. For any other additional information, send your comments to the net controller: Ernie Bracy W1BFA, PO Box 88, Readfield, Maine 04355, USA. Ernie will send you the membership card and an up-to-date list of members. Best 73s from Portugal.

THAILAND

Tony Waltham HS1AMH
c/o Bangkok Post
U Chuliang Building
Rama 4 Road
Bangkok 10500
Thailand

Hopes are still high for getting full HF privileges for qualified amateur-radio operators in Thailand, and the most positive remarks in this respect came late last year when Communications Minister Samak Sundharavej told members of the Radio Amateur Society of Thailand (RAST) that he would do his best to legalize amateur radio.

The minister was addressing a gathering of RAST members on the occasion of the 20th anniversary of the founding of the society. On that occasion the minister also spoke on HF and reiterated his pledge to the net control station of SEANET that evening (November 11, 1984), V85GA, in Brunei. (SEANET—Southeast Asia Net meets nightly at 1200Z on 14.320.)

Throughout last year, RAST had strived to work towards full recognition and legalization of amateur radio by the Royal Thai Government. To this end, a dialogue was opened by senior members of the RAST committee with top-ranking Post and Telegraph Department officials. This included an informal discussion with Director General of the PTT, Mr. Mahidol Chantrangkoon. This dialogue is continuing, and further talks have been conducted in early 1985, all ending on a positive note.

The main holdup now would seem to be for the authorities to establish the necessary qualifications for operators, the allocation of specific radio spectrum, and a clearance from the National Security Council, the top government watchdog under the Office of the Prime Minister.

In other respects, RAST has maintained Thailand's international standing by applying for, and receiving, permission from the PTT to operate during major amateur-radio contests. This is an ongoing activity, and RAST recently sent an appeal to several DX magazines for dates of major contests so that the society can get its application for permission to operate in good time.

Contest operations last year enabled many radio amateurs throughout the world to establish a contact with radio amateurs in Thailand as well as to demonstrate to the IARU and other regulatory bodies that amateur radio is still very much alive in Thailand, albeit at the moment somewhat restricted. In order to achieve this, club members worked to set up the club's own HF station located at the Asian Institute of Technology campus at Rangsit, 45 km north of Bangkok.

One significant operation followed an approach by the Japan UNICEF Ham Club to operate here for three days on behalf of the Fund. In this operation alone, operating with the special callsign HS0JUA, over 3,000 contacts were made. A similar operation in 1983 raised over US$500,000 for the Fund. Figures for the entirely-voluntary donations being made following last year's (1984) operation in July are yet to be finalized.

Other major contests include the European DX Contest, the SEANET Contest, and the CQ Worldwide Contest when HS0A was active on all HF bands.

A special station was also set up at the venue for the 20th anniversary celebrations of RAST where many visiting nonhams were able to witness for the first time a two-way contact with other radio amateurs thousands of miles away, using both Morse code and phone.

The club station was active during the following contests: As HS0A—SEANET DX Contest (phone), August 21–22; European DX Contest (phone), September 8–10; *CQ* Worldwide Contest (phone) October 27–28; RAST anniversary celebrations on November 11 at Hyatt Central Plaza Hotel, and as HS0JUA for UNICEF, July 27–30. (QSL cards to the Bureau address, G.P.O. Box 2008, Bangkok 10501 Thailand.)

International standing was also maintained by corresponding with the IARU, the ARRL, and other major amateur-radio societies, informing them of our activities and updating such publications as the international edition of the *Callbook*.

In addition, extensive information on amateur-radio activities in 15 countries in the region was supplied to the Post and Telegraph Department. Much of this was gleaned from helpful articles in "*73* International," and credit, of course, has been given in the text in the form of references.

For amateur-radio operators in countries where licensing is automatic upon proving the necessary skills and experience, the issue of conveying the importance of amateur radio—in self-training, in emergency communications and other aspects of the service—is perhaps overlooked. Yet many countries the world over restrict amateur radio, if they do not ban it altogether. It would seem to benefit more than mere DXers if members of some kind of action group would cull out all the best examples where amateur radio has rendered an invaluable service, or helped in training an acknowledged expert who admits that without an interest in amateur radio he would never have made whatever breakthrough he achieved in the field of electronics.

Thailand is surrounded by countries where amateur radio is dormant. Burma, Laos, and Cambodia, for different reasons, remain silent. Not much further afield Bangladesh and Vietnam also offer silent testimony to a stifled hobby. Any means to help promote this hobby would surely be in everyone's interest. Both Burma and Bangladesh have national radio societies, while other countries which oppose the hobby generally have resident radio amateurs working in embassies or as expatriates. All would benefit from a central "data base" or committed group. RAST committee members, meanwhile, have been doing their best to convince the authorities of the benefits to be derived from the service.

During the society's annual general meeting held in December, 1984, Khun Chamnong Bhirom Bhakdi HS1WB was re-elected President of RAST. First Vice-President is Yongyuth Napasap HS1DS; Second Vice-President is Mrs. Mayuree Chotikul HS1YL; Secretary-General is Hans Hollstein HS1BG, and the Treasurer is Rasdaporn Boonpitak HS1DC.

A rendezvous in Portugal. From left to right: PY4LF, CT4UE, CT1BON, ZS1XP, and CT1AXY.

Spreading the word. Tony HS1AMH at the mike during the 20th anniversary celebrations of the Radio Amateur Society of Thailand. The large number of bystanders is testimony to the fascination and interest that the hobby generates. Seated next to Tony is Eddy HS1ALP.

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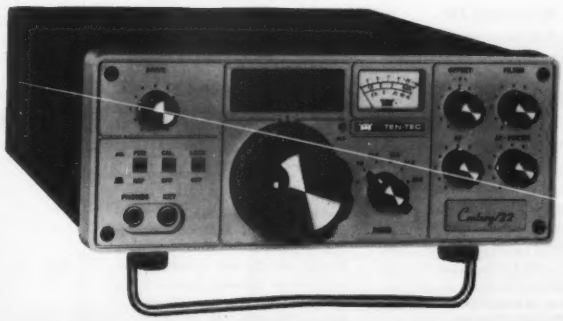

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ALASKA						20	20					
ARGENTINA	20	20	20	40			20	20	15	15	15	15
AUSTRALIA		20	20	20	40	40	20					
CANAL ZONE	15	40	40	40	40[1]	40		15	15	15	10	10
ENGLAND			40[1]	40			20	20	20	20	20	20
HAWAII			20		40		20					
INDIA												
JAPAN						20	20					
MEXICO	15	40	40	40	40[1]	40		15	15	15	10	10
PHILIPPINES							20					
PUERTO RICO	15	40	40	40	40[1]	40		15	15	15	10	10
SOUTH AFRICA			40	40		20	20				20	
U. S. S. R.							20	20		20		
WEST COAST	20	40	40	40[1]	40[1]	40						20

CENTRAL UNITED STATES TO:

ALASKA		20	20					20	20			
ARGENTINA	15	20	20	40			20	20			15	15	15
AUSTRALIA	15	20	20	20	40[1]	40		20			20	
CANAL ZONE	15	20	20	20	40[1]	40	20	20	15	15	15*	10
ENGLAND	20	40					20	20		20	20	20*
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PUERTO RICO	15	20	20	20	40[1]	40	20	20	15	15	15*	10
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U. S. S. R.								20			20	

WESTERN UNITED STATES TO:

ALASKA		20	20						20			
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1 = Possible 80-meter openings.
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G = Good, F = Fair, P = Poor.

JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F-P
2 F	3 F	4 F-P	5 F-G	6 G	7 G-F	8 F
9 G	10 G	11 F	12 F-G	13 F	14 P	15 P
16 F	17 P	18 P	19 F	20 F	21 F-G	22 G
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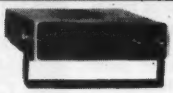

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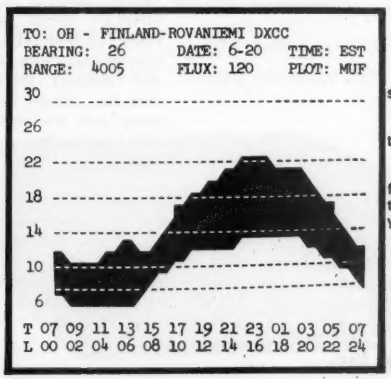

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- The secret is a SIMPLEX autopatch, The *SMART PATCH.*

SMART PATCH Is Easy To Install

To install *SMART PATCH*, connect the multicolored computer style ribbon cable to mic audio, receiver discriminator, PTT, and power. A modular phone cord is provided for connection to your phone system. Sound simple? . . . IT IS!

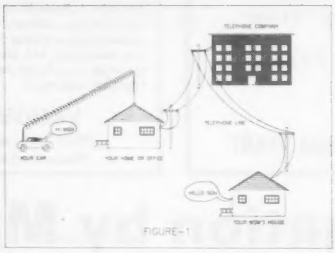

FIGURE-1

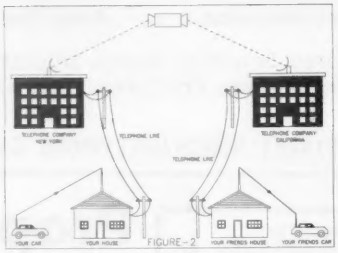

FIGURE-2

How To Use *SMART PATCH*

Placing a call is simple. Send your access code from your mobile (example: *73). This brings up the Patch and you will hear dial tone transmitted from your base station. Since *SMART PATCH* is checking about once per second to see if you want to dial, all you have to do is key your transmitter, then dial the phone number. You will now hear the phone ring and someone answer. Since the enhanced control system of *SMART PATCH* is constantly checking to see if you wish to talk, you need to simply key your transmitter and then talk. That's right, you simply key your transmitter to interrupt the phone line. The base station automatically stops transmitting after you key your mic. *SMART PATCH* does not require any special tone equipment to control your base station. It samples very high frequency noise present at your receivers discriminator to determine if a mobile is present. No words or syllables are ever lost.

SMART PATCH Is All You Need To Automatically Patch Your Base Station To Your Phone Line.

Use *SMART PATCH* for:

- Mobile (or remote base) to phone line via Simplex base. (see fig 1.)
- Mobile to Mobile via interconnected base stations for extended range. (see fig. 2.)
- Telephone line to mobile (or remote base).
- *SMART PATCH* uses SIMPLEX BASE STATION EQUIPMENT. Use your ordinary base station. *SMART PATCH* does this without interfering with the normal use of your radio.

WARRANTY?
YES, 180 days of warranty protection. You simply can't go wrong.
An FCC type accepted coupler is available for *SMART PATCH.*

Communications Electronics Specialties, Inc.
P.O. Box 2930, Winter Park, Florida 32790
Telephone: (305) 645-0474 **Or call toll-free (800)327-9956**

Yaesu has serious listeners for the serious listener.

Yaesu's serious about giving you better ways to tune in the world around you.

And whether it's for local action or worldwide DX, you'll find our VHF/UHF and HF receivers are the superior match for all your listening needs.

The FRG-9600. A premium VHF/UHF scanning communications receiver. The 9600 is no typical scanner. And it's easy to see why.

You won't miss any local action with continuous coverage from 60 to 905 MHz.

You have more operating modes to listen in on: upper or lower sideband, CW, AM wide or narrow, and FM wide or narrow.

You can even watch television programs by plugging in a video monitor into the optional video output.

Scan in steps of 5, 10, 12½, 25 and 100 KHz. Store any frequency and related operating mode into any of the 99 memories. Scan the memories. Or in between them. Or simply "dial up" any frequency with the frequency entry pad.

Plus there's much more, including a 24-hour clock, multiplexed output, LCD readout, signal strength graph, and an AC power adapter.

The FRG-8800 HF communications receiver. A better way to listen to the world. If you want a complete communications package, the FRG-8800 is just right for you.

You get continuous worldwide coverage from 150 KHz to 30 MHz. And local coverage from 118 to 174 MHz with an optional VHF converter.

Listen in on any mode: upper and lower sideband, CW, AM wide or narrow, and FM.

Store frequencies and operating modes into any of the twelve channels for instant recall.

Scan the airwaves with a number of programmable scanning functions.

Plus you get keyboard frequency entry. An LCD display for easy readout. A SINPO signal graph. Computer interface capability for advanced listening functions. Two 24 hour clocks. Recording functions. And much more to make your listening station complete.

Listen in. When you want more from your VHF/UHF or HF receivers, just look to Yaesu. We take your listening seriously.

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Yaesu Cincinnati Service Center
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Dealer inquiries invited.

Prices and specifications subject to change without notice.
FRG-9600 SSB coverage: 60 to 460 MHz.

KENWOOD

pacesetter in Amateur radio

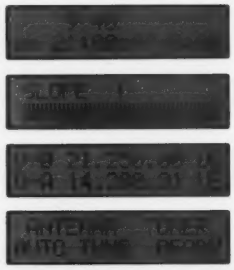
NEW!

"DX-cellence!"

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK,**



Optional accessories:

• AT-940 full range (160-10 m) automatic antenna tuner • SP-940S external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First.

More TS-940S information is available from authorized Kenwood dealers.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.